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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. SEPTEMBER 14, 1899. CHICAGO, ILL. NUMBER 37

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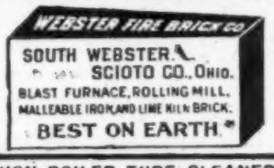
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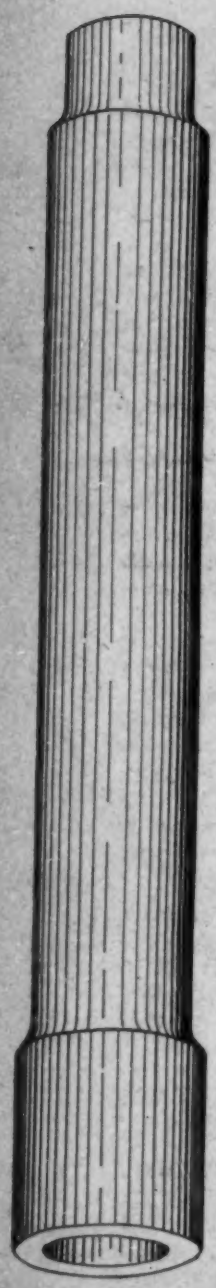

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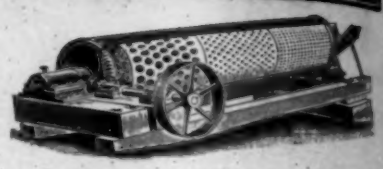

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. SEPTEMBER 14, 1899. CHICAGO, ILL. NUMBER 37

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Pig iron continues to be the leading feature of the market, and rising prices seem only to have stimulated buying. So far as non-Bessemer iron is concerned there is a general feeling that transactions of recent weeks for delivery in the first half of 1900 are at the minimum prices for that period, and that what changes come will be in the direction of higher values. The situation as to Bessemer iron, steel and finished material for next year is of slower development, though in the past week there are evidences that in all these lines the lead of foundry iron is about to be followed and contracts entered into at substantially to-day's figures. This is true in Bessemer iron, in which a sale of 15,000 tons by association furnaces for the first quarter of 1900, at $22.50 valley furnace, is the most significant development of several weeks. In steel there is practically nothing tangible on which to make a statement of the probable basis for next year. The beginning of inquiry for sheet bars has been heard of in the Central West, and while nothing is fixed, indications are that a price between $35 and $38 may be made. The renewal of active work on the combination of sheet mills will operate to deter trading for a while. It seems more certain as the fall advances that business for the early months of 1900 will be not far from the prices of to-day, in finished material as well as pig iron. Yet billets and rails, even with the latter at $31 and $32, are quite out of joint, and it is a question if this anomalous condition will be perpetuated in contracts running over a period of months. On the other hand the rail manufacturers are hardly likely to make a price to the railroads that will cause curtailment of orders and postponement of buying, and particularly in view of the Western purchases already made at to-day's quotations. It is known that sales of steel bars, for example, have been made at $45 to $50 a net ton for next year, and of plates at $6c a net ton for tank; structural material has been bought at $45 a net ton. In relation to these prices the present basis of $38 to $4c for Bessemer steel is certainly high. The trade is still studying the effect of present prices upon demand, and finds little that is conclusive. It is known that some construction work has been put aside by the high prices for shapes and plates. It is reported that railroads have received bids on considerable lots of cars and then decided to wait for lower prices. But the crowded condition of car and locomotive works indicates that the wait may stretch through months. There are signs that plate mills will be in better shape for new business in the first half of 1900 than was thought, and inquiries for both bars and plates from Central Western agricultural works are under consideration. The foundry trade, which is a most reliable index of general conditions, is more and more active under advancing prices, and it is because foundries are offered more work than they can take care of that they are readily paying the prices asked by furnacemen, creating a condition that compels advances in pig iron from week to week.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World.*
705 PUBLICATION BUILDING, Sept. 13.

There has been no decided change in prices in the iron and steel market in the past week. Prices of pig iron are generally somewhat higher, and steel for this year's delivery is a shade stronger. In the more finished lines prices are about as they were. In Bessemer iron, interest centers more in deliveries for this year, while furnaces have practically nothing to offer. What little production for the first quarter of next year remained available for sale has been largely disposed of. There is nothing doing in steel for next year, but sales continue in some lines of finished material.

The unprecedented demand for foundry iron continues. It is extraordinary that by the early part of September nearly the whole of the production of the furnaces should be sold for the first half of the following year, yet such is the case now. In comparison with this state of affairs, it is remarkable that there is practically no inquiry for steel for next year's delivery. It is well understood that steel makers are not convinced of there being any necessity of selling steel for next year at below the present famine prices, while buyers have not, at least yet, become convinced that they will be justified in paying such prices. There is a growing feeling that stocks of finished material in the hands of dealers are larger than has generally been believed. Although this view may be found to be correct, and although it may affect the situation within the next six months, it is certain that manufacturers in many lines are suffering severely from a lack of material which they desire to put into ultimate consumption. At this writing, it is absolutely impossible to make any predictions as to the continuance of the present level of prices, or, if they should fall, as to the suddenness and extent of the drop. This much may be safely asserted, that it is as easy to believe, under existing conditions, that prices will drop materially before next April as that they will be maintained at substantially the present level. Two months ago such an assertion could not have been honestly made.

PIG IRON.—The executive committee of the valley furnacemen's association, which has complete control of the selling for the furnaces represented, met in Cleveland last week, and sold some 15,000 tons of Bessemer iron for the first quarter of next year, at $22.50, valley furnace. The members of the committee did not feel justified in selling any more iron for the first quarter, at least at the present time. The excess of production over what has already sold cannot be very great, and it may be practically nothing. There is some interest in iron for the second quarter, but not much. The demand, such as it is, comes wholly from steel mills which desire to cover for steel sold in the finished form. There has been practically no iron bought for conversion into steel to be sold in the form of slabs or billets. There is practically no Bessemer iron to be had for this year, and the odd lots of 50 and 100 tons sold from time to time do not make the market, although the price is considerably higher than $22.50. In foundry iron there has been considerable activity during the week, and furnaces making foundry iron are almost wholly sold up to the middle of the year, while round lots have been sold for the second half. In No. 2 there is practically nothing to be had this side of July 1, while No. 1 is also very scarce, and with No. 3 the conditions are almost as bad. Prices for all grades are up about $1 a ton since last report. In gray forge there has been active selling and very little can be had this side of Jan. 1, while prices are firmer. We

note a sale of about 3,000 tons at $20 delivered Pittsburg. Prices at Pittsburg are up about 50 cents a ton, the valley price remaining about as last quoted. In both foundry and forge iron the urgency of buyers as to delivery is such that prices are difficult to quote on account of premiums paid for early delivery. We quote the market as follows:

Bessemer, valley furnace	$22.50 to $22.75
Bessemer, Pittsburg	23.25 to 23.50
No. 1 Foundry	21.50 to 22.00
No. 2 Foundry	21.00 to 21.25
No. 3 Foundry	20.50 to 21.00
Gray Forge, valley furnace	19.25 to 19.75
Gray Forge, Pittsburg	20.00 to 20.50

STEEL.—The steel market has been very quiet. Odd lots are sold from time to time for delivery during the balance of this year, but the range of prices named is remarkably wide, even for times such as these. While quotations as low as $38 at mill are metioned, it is doubtful if anything could be had below $40, delivered Pittsburg, and higher figures than this are freely quoted. The steel mills are on an average fully three months behind in filling specifications, there being quite a range on account of their being much further behind on some sizes than on others. Slabs continue to be scarcer than billets. In open-hearth billets $50 is a minimum.

FERRO-MANGANESE.—The demand for ferro is very good, and the lowest price named is $100, for moderate sized lots.

RAILS AND TRACK MATERIAL.—For some time past the rail market has been rather quiet, it being felt, on one side at least, that present scheduled prices, although far below billets, are too high to expect railroads to take hold for next year. This sentiment is gradually changing, and railroads seem to be dickering with the idea of buying if only a moderate concession can be secured. We quote prices nominally as follows. 100-ton lots and over, $30; carloads and over, $31, less than carloads, $32, all for standard sections. In track material the demand continues good, at prices unchanged as follows: Spikes, 2.50c to 2.60c; track bolts, square heads, 3 10c; hexagon heads, 3.25c; splice bars, 1.75c to 1.90c; links and pins, 2.60c to 2.65c.

BARS.—Both steel and iron bars are stronger. The leading producer in this district has made a flat price of 2.50c for steel bars, half extras, and this price cannot be materially shaded. For iron bars from all muck iron we quote 2.25c to 2.35c.

STRUCTURAL MATERIAL.—It is stated that the demand for structural has been rather good in the past week or two. Mills are decidedly behind in deliveries. We quote prices unchanged as follows: Beams and channels, 3 to 15 inches, 2.25c; 18 to 24 inches, 2.35c; tees, 2.30c; zees, 2.25c; angles, 2.25c. Universal mill plates remain at 2.60c to 2.75c.

PLATES.—The plate market continues very strong and deliveries this side of January are hard to get. Prices are largely nominal, because mills are generally not in position yet to figure closely on what they can do for next year, being decidedly behind in deliveries and being in an uncertain position as to raw materials. There is more inquiry for 1900, however, and business may result. We quote as follows for delivery in December and January Tank, 2.65c to 2.70c; shell 2.75c to 2.80c; flange, 2.85c to 2.90c; fire box, 3½c to 4c.

PIPES AND TUBES.—The situation as to prices and demand is unchanged. The new company is rearranging orders among the various mills, and is prepared to make shipment of most sizes within two months. We quote discounts unchanged, as follows: Merchant pipe, base discount, 50 per cent and additional discounts of two 10's for less than carloads and two 10's and 5 for carloads, with free delivery on the latter within the prescribed territory; lap weld casing 40 for screw and socket joint and 35 for inserted joint, with 5 per cent additional on carload orders; boiler tubes, 1¼ to 1½ inch, 40 per cent; 1 to 2inch, 50 for iron and 55 for steel; 2¼ to 6-inch, 55 for iron and 57 for steel; extra 5 per cent to dealers.

SHEETS.—Active work has been done in the past week on the consolidation of sheet mills, but the movements of those at the helm are being carefully guarded. There is every prospect that arrangements with the mills will be completed within a month or so, but as the options do not expire until November 1 the consummation may not occur until that date. In any case the new company will be in charge of the business by the first of the year. Prices are if anything firmer than at last report, and 3.25c for No. 28 is practically out of the question, quotations generally ranging from 3.35c to 3.50c. The mills are a unit in declaring that prices are relatively too low, but to bring them up further seems to be a difficult matter. In galvanized iron there has been a slight weakening, but the general quotation of 70 and 5 per cent off, with a 15 cent freight allowance, has been restored.

SPELTER.—The spelter market has weakened materially, and prime Western grades are now quoted at 5.45c, Pittsburg.

OLD MATERIAL.—All lines of old material are scarce, and prices are very irregular and higher for melting stock and old rails. We now quote prices as follows Pittsburg, gross tons, except where otherwise specified: Heavy melting stock, $18 to $20; steel rails, mixed lengths, $19; iron rails, $23 to $24; cast borings, $9, net tons; cast scrap, $16 to $17; No. 1 wrought scrap, $17, net tons; busheling scrap, $13 to $14, net tons.

COKE.—The coke market is very strong. Occasional sales of spot coke are being made by consumers at prices above the general market. Deliveries are not as good as they might be, from the standpoint of furnaces, but the enormous demand is really being well taken care of. For strictly Connellsville coke we quote $2.50 for furnace and $2.75 to $3 for foundry.

CHICAGO.

Office of The Iron Trade Review and Industrial World,
1522 MONADNOCK BLOCK, Sept 13.

Sales agents report a heavy demand for nearly all classes of material in the past week, with good sales of some grades. Prices continue exceedingly firm, and have been advanced on some kinds of iron and steel. Most of the buying of the week was for delivery in the first half of next year, and some of it was for the entire year. So far as this year is concerned, there is so little material for delivery that sales are limited to a small volume.

PIG IRON.—Advances have been made on both Northern and Southern irons in the week, and even at the present prices furnaces are not pushing for business at all. Southern quotations, also, are subject to an advance in freight rates aftrer the first of the year. It has been announced that freight rates will be advanced 20 cents Jan. 1, and it is thought this may be increased before the arrival of that date. Sales last week were of large volume, particularly in Southern irons, of which over 15,000 tons were sold in this market. Furnaces are not anxious to sell for delivery during the entire year of 1900, and are limiting orders to deliveries in the firsthalf of the year. The demand continues large, and sales will undoubtedly aggregate a large tonnage for some time to come. Quotations are revised as follows:

Lake Sup. Charcoal	$24 00 @ $26 00	Southern Coke No. 3	$20 65 @ $21 00
Local Coke Fdy. No. 1	23 00 @ 24 00	Southern No. 1 Soft	22 65 @ 23 00
Local Coke Fdy. No. 2	22 50 @ 24 00	Southern No. 2 Soft	21 65 @ 22 00
Local Coke Fdy. No. 3	22 50 @ 23 00	Southern Silveries	25 15 @ 26 00
Local Scotch Fdy. No. 1	23 00 @ 24 00	Jackson Co. Silveries	29 00 @ 30 50
Local Scotch Fdy. No. 2	22 50 @ 24 00	Ohio Strong Softeners	23 00 @ 24 00
Local Scotch Fdy. No. 3	22 00 @ 23 00	Alabama Car Wheel	24 50 @ 25 00
Southern Coke No. 1	22 65 @ 23 00	Malleable Bessemer	23 00 @ 23 50
Southern Coke No. 2	20 90 @ 21 40	Coke Bessemer	23 50 @ 24 00

BARS.—Sales in the week were of good size, and included several large orders. One contract of 2,000 tons of steel was placed with the local mills. Mills are not pushing for business, but are only taking what is offered them, and in some cases, when deliveries asked do not meet their views, have requested the buyers to cut the size of the order. Common iron is selling at 2 20c to 2.30c, with advances on less than carloads. Soft steel bars are quoted 2.30c to 2.40c, half extras, by local mills, and considerable more is asked by Eastern mills.

CAR MATERIAL.—The demand continues good, indicating considerable orders placed and in the market for cars. One contract for 1,000 cars was placed the first of this week.

STRUCTURAL MATERIAL.—Considerable speculation is being indulged in as to the probablities of the success of the proposed bridge combination. As the deal stands at present, several of the larger Western concerns are out of it, although the final combination may include all of these if they get their price. It is thought the matter will be settled finally one way or the other, wthin the next week. Business last week was not very large, aggregating something over 3,000 tons, and the demand is not increasing, as is natural at this season of the year. Considering the season, however, it is very good. There have been no changes in quotations, which are firm. Prices are as follows: Beams, 15 inches and under, 2.40c; 18 inches and over, 2.50c; angles under three inches, and over

six inches, 2.50c; three inches to six inches, 2.40c; sheared plates, 3.15c to 3.25c; universal plates, 3.15c to 3.25c; tees, 2.45c; zees, 2.40c; small lots from store are quoted from ¼c to ½c higher.

PLATES.—Sales are limited, as the mills are in position to accept but very little business for delivery this year, and are pretty well sold up for the first half of next year. What small lots are offered for immediate shipment are promptly snapped up. Prices are made as follows: Tank steel from store, 3.40c to 3.50c. Mill shipments, Chicago delivery: Tank steel, 3.25c; shell, 3 35c; flange, 3.40c; marine, 3.40c; fire box, 4c to 6c according to brand.

MERCHANT PIPE.—Sales are of good size, and would be larger were the mills able to supply the demand, which is very heavy. Prices are firm at 50 to 50 and 5 per cent off.

SHEETS.—Black and galvanized sheets sold well in the week, several good contracts having been closed. The demand appears to be increasing. No. 27 black sheets are quoted at 3.25c to 3.40c, Chicago, mill shipment, and galvanized at 70 and 5 per cent off, mill shipment, and 70 off from store.

MERCHANT STEEL.—The demand was a little larger, and sales were increased slightly in the week. The mills are not anxious for business, and only take what is offered. Smooth finish tire steel is quoted 2.80c to 3c; smooth finish machinery steel, 2.95c to 3.05c; spring steel, 3.50c to 3.70c; tool steel, 7c to 7.50c; special, 13 50c and upwards.

BILLETS AND RODS.—In the absence of transactions, no prices are made.

RAILS AND TRACK SUPPLIES.—The mills still refuse to make prices on standard sections, although inquiries are heavy, and no sales are reported for the week. It is thought the question of prices will be settled within the next two weeks. Railroad inquiries indicate a heavy tonnage of rails to be placed for the coming year's deliveries. Quotations are as follows: Rails, light sections, $31 to $37; splice bars, 1.80c to 2.50c; spikes, 2.40c to 2.50c; track bolts, 2.90c to 3.25c.

OLD MATERIAL.—The demand continues heavy, with a limited supply, which makes small sales. Quotations are difficult to make, as they fluctuate daily, and so many different views are held as to values. The following are about the average selling quotations:

Old iron rails, gross	$22 00@$22 50	Axles, net	$19 00@$20 00
Old steel rails, long, gr.	16 00@ 16 50	Cast borings, net	7 00@ 7 25
Old steel rails, mixed	15 00@ 15 50	Wrought turnings, net	7 50@ 8 00
Old wheels, gross	15 50@ 16 00	Axle turnings, net	8 50@ 9 00
Railroad forge, net	16 00@ 16 50	Mixed steel, gross	12 00@12 50
Dealer's forge, net	12 50@ 13 00	Stove plates, net	7 50@ 8 00
No. 1 mill, net	9 00@ 9 25	Heavy melting steel, gr	14 00@14 50
Heavy cast, net	13 00@ 13 50	Old iron splice b., net	16 50@17 50
Malleable cast, net	10 00@ 11 00		

WIRE AND WIRE NAILS.—The demand continues heavy and sales last week were large. Country buying increases every week. The market is very firm and at the quotations. Makers quote single car loads of wire nails at $2 95 f. o. b. Chicago, and $3.05 less than car loads. On wire current quotations are as follows: Plain annealed wire, $2.80; painted barb wire, $3.40; galvanized barb wire, $3.55.

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World.*
27 VINCENT ST., Sept. 13.

The size of the shortage in ore sold for delivery the present season is the overshadowing question in the ore trade. The advance of freight rates and the matter of dispatch for vessels are incidental compared with it. The furnacemen who have received notices concerning certain ores of which shipments will fall below sales, have tangible evidence of the condition in which their ore supplies will be left by the closing of navigation. In the case of one Mesabi property notice has been given that only half the ore sold can be mined. The heavy shipments to Sept. 1, which according to completed figures were 10,646,913 tons, indicating the unprecedented total of 3,007,207 tons for August, may lead to the belief that all the ore counted on will get down. But statistics of production and of shortages now definitely known show a deficiency running into hundreds of thousands of tons. It is certain that consumption of Lake Superior ores is now above a yearly rate of 16,000,000 tons, and naturally this year's scarcity will help to make the basis for next year's prices. The effect of the past week's embargo on Lake Superior ore traffic is hard to estimate. Though the Houghton was raised and swung around so as to open the channel, in the St. Mary's River, on Sept. 10, the procession of delayed craft was detained further on Sept. 11 and 12 by low water, and the jam and delay at Lake Erie ports will be something unprecedented. A holiday taken by ore unloaders in Cleveland adds to the delay. The probability is that the poor dispatch that will be a feature in ore for some time will keep wild boats out of that trade, with the result that ore shipments will be further reduced. The purchase of the Aurora mine by the Oliver Iron Mining Co., is an important event of this week, as indicating further concentration of the well known properties in strong hands. Further wage advances have been made at some Lake Superior mines. As an index to next season's lake freights, it is stated that 3½c has been offered for first grain trips out of Duluth in 1900, equivalent to $1.30 on ore. Chartering is light this week in view of the congestion of the ore traffic, but $2 has been done from Duluth. Nothing is reported from Marquette. Escanaba tonnage has been placed at $1.25, but in view of the Chicago corn rate the figure will be higher on the next charters.

PIG IRON.—No formal action has been taken by the Bessemer furnacemen on a general price for deliveries in 1900; but it is understood that some iron was sold at $22.50, valley, the figure fixed at an executive committee meeting held last week to act on an inquiry. About 15,000 tons is reported sold at this figure for delivery in the first quarter of 1900. There have been some sales also of outside iron on practically the same basis. Negotiations by a large interest have not yet resulted in business. It continues to be the policy of the valley furnaces to make no quotations except to consumers who are actually in the market. The situation as to foundry iron is stronger, with sales from week to week for the first half of 1900, at $20.50 to $21 valley furnace. Foundrymen who yet need iron for this year are in the market, but with all the efforts of sellers to find them iron, some are bound to be disappointed. It is evident that the foundries are getting much more work than they counted on. Gray forge has been scarcer and has gone higher. We quote $20 to $20.25, valley for Northern. Southern is delivered in the valley at $19.75 to $20.

Bessemer	$23 25	Valley Scotch No. 1	$21 75@22 75
No. 1 Strong Foundry	21 50@ 22 50	Valley Scotch No. 2	21 25@21 75
No. 2 Strong Foundry	21 25@ 21 75	Gray Forge, valley	20 00@20 75
No. 3 Foundry	20 75@ 21 25	Lake Superior Charcoal	24 00@25 00

FINISHED MATERIAL.—Every week brings some buying of rolled material for delivery next year. Buying of structural material, for example, by bridge and construction companies, is going right on, upon the basis recently established. In the city of Cleveland the amount of building this year has been without precedent. Large steel structures have not been numerous, but the aggregate of small needs in structural steel has been considerable. The agricultural works have been making inquiry for bars and plates, and while large contracts will not be made, there is prospect of fair buying on the basis of about 3c for tank plate and 2.50c Pittsburg, for steel bars. Some plate mills that have considered themselves sold for several months into 1900 find that their production will exceed expectations and are able to take on some business. We continue to quote bar iron at 2c valley, half extras, in carload lots, less than five sizes in a car, with .05c for cutting to length. Full extras on less than carload lots. Pipe demand must be met from stock, mills being full for four to five months. Dealers quote 50 and 10 to 50 per cent off. Sheets are steady at the $5 advance noted last week. We quote No. 27 at 3.30c at mill.

WIRE AND WIRE NAILS.—The American Steel & Wire Co. reports that demand for nails continues large, and shipments are behind hand. Wire products are also active and the fall demand has begun earlier than usual. The advance of 50 cents in painted barb wire, owing to the introduction of more effective and more costly processes, makes only a 15 cent differential between painted and galvanized and may increase the demand for the latter. We quote Pittsburg mill prices to jobbers in carload lots: Wire nails, $2.65; plain annealed wire, $2.50; painted barb wire, $3.10; galvanized, $3.25. To retailers carload lots are 15 cents per 100 pounds higher.

OLD MATERIAL.—The market is firm and in steel works material prices tend upward. We quote old steel rails, $17; cut to length, $18; old car wheels, $18; old iron rails, $22 to $23, gross tons. No. 1 railroad wrought scrap, $17.50 to $18

mill scrap, $13.50; machinery cast scrap, $14.50 to $15; wrought turnings, $10 to $10.50; cast borings, $9 to $9.50.

CINCINNATI.

Sept. 12.

Buying of pig iron in this market has evidently been stimulated by recent advances, and the tone of the market is more or less excited. Matthew Addy & Co. say in their current comment: "The quiet period in the pig iron market which has been so long expected seems continually to recede. As an Irishman would say, it gets farther and farther off the nearer we get to it. The past week has witnessed two advances in Southern pig. Gray forge has jumped to $15.50 Birmingham, and this price has not stopped sales. In fact, the market is to-day intensely active and there seems to be absolutely no limit to the demand. On the other hand, the supply is anything but adequate. This is strikingly shown by the fact that as many offers have been turned down as have been accepted, and the offers that have been turned down have not been rejected because of prices but because of an utter inability to make delivery on contract time. Every come plaintive appeals from belated buyers who want something that simply cannot be supplied. Throughout all this section the general foundries are rushed as they have not been rushed for many years. Many of them report that they have had toturn down as much work as they accepted. Of course the developments of the past few weeks hvae made itvery evident that there can be no break in the market for many months to come simply because all the iron that can be produced and delivered during those months has been sold, and this very fact is the strongest guarantee of continued strength."

Rogers, Brown & Co. say: Quotations can hardly be published that will cover the wide range in prices. Silvery, soft and higher grades of foundry iron for early delivery command a very decided premium, and buyers do not hesitate to an advance of $1 per ton when iron is actually needed. The same urgency exists for heavy shipments on old contracts, and when crops begin to move freely and the scarcity of cars becomes more apparent, there will undoubtedly be considerable distress. There have been heavy sales of all classes of iron of this year and next, and some who are well informed as to actual conditions are talking about $25 iron in the next 60 days. No apprehensions seem to be felt that the present range of prices will check consumption, and there is nothing in sight to indicate that there will be any backset during the first half of the next year. To the uninitiated it seems strange that hot weather should cause furnaces to produce cold iron, but statistics show that the proportion of mill grades during the heated term is much larger than during the winter months, and there is a consequent scarcity of higher grades of foundry and soft irons. This condition is now acute and foundrymen are suffering in consequence, because of inability of furnaces to make deliveries in accordance with contracts." We quote for cash f. o. b. Cincinnat: Southern coke, No. 1 foundry, $21 to $21.50; No. 2, foundry, $20 to $20.50; No. 3, foundry, $18.75 to $19.25; No. 4 and gray forge, $18.25 to $18.75; No. 1 soft, $21 to $21.50; No. 2 soft, $20 to $20.50; Lake Superior coke, No. 1, $22.50 to $23; No. 2, $22 to $22.50; Hanging Rock charcoal, No. 1, $22 to $23; Jackson Co. silvery, No. 1, $28 to $28.50; standard Georgia car wheel, $20.50 to $21; Lake Superior charcoal, $25.

PHILADELPHIA.

Sept. 12.

There is perhaps a steadier feeling in the pig iron market. While prices are very firm there is a more general disposition to meet demand at prices recently established. Prices are fractionally higher with some sellers, stationary with others. This comes from the wide variation heretofore existing in quotations. No. 2 ranging from $21.50 to $23 in Philadelphia. This week the gap is less, and most of the current business would be represented by $22 to $23. At Lehigh valley furnaces $21 is minimum. As matters stand buyers have as a rule provided in part for next year, and sellers have made some sales for the first half, so that conditions may be easy for a time. The scarcity for early deliveries is more pronounced, even in the face of a moderate increase in production. Something has been done in the direction of securing low phosphorus Bessemer from foreign sources, the home product being so scarce and so high. In steel the price is nominally $41, but $43 to $45 would have to be paid for deliveries in the next month or two. Some orders for fair amounts of finished material have been taken in the past week, all at full prices or better. The limitations upon business in some lines is due to the fact that sellers having fallen considerably behind on deliveries want to guard against further over selling. Refined bars have brought 2.05c at mill, and plates 2.80c to 2.90c. Shapes as well as plates command a sharp premium for early deliveries. We quote 2.43c minimum on beams and channels. Sheets are 3.30c to 3.40c for Nos. 21 to 27. Old material is firmly held, but no advance is reported over last week. Sellers would not shade prices, as to replace their stocks would require them to pay the going basis. We quote choice railroad scrap at $21 to $22; machinery cast scrap at $15 to $15.50; heavy steel scrap at $17.75 to $18.25; old iron rails, $23 to $23.50; old steel rails, $19 to $20; wrought turnings, $13 to $13.50; cast borings, $11.50 to $12.

The Bridge Works Consolidation.

The project to bring the principal bridge works of the country into a consolidation is being pushed anew, and in the past week some of the leading interests have been in conference in New York. It is now settled that a number of companies, particularly in the West and Central West, on whose plants options were asked, will not enter the new company, at least on the terms that have been offered. The Massillon Bridge Co., Massillon, O., is not in; neither is the King Bridge Co., of Cleveland. Some other Ohio plants are outside, as are some further west. The Pittsburg concerns that are understood to be optioned in the deal are the Keystone Bridge Co., the Shiffler Bridge Co., and the Schultz Bridge & Iron Co. Names proposed for the new corporation are the American Bridge Co., the Republic Bridge Co., and the United Bridge Co. The financing is in the hands of J. & W. Seligman & Co., of New York. The $65,000,000 of capital stock is to be divided into $22,000,000 seven per cent cumulative preferred and $43,000,000 common. The leading Eastern movers in the project are the Pencoyd Iron Works of A. & P. Roberts Co. In addition to this and the Pittsburg plants the following are said to be unnder option: Missouri Valley Bridge & Iron Works, Leavenworth, Kan.; American Bridge Works, Chicago; Post & McCord, New York; Berlin Iron Works, East Berlin, Conn.; Groton Bridge & Mfg. Co., Groton, N. Y.; Elmira Bridge Co., Elmira, N. Y.; Union Bridge Works, Athens, Pa.; the bridge department of the Pennsylvania Steel Co.; Phoenix Bridge Co., Phoenixville, Pa.; Penn Bridge Co., Beaver Falls, Pa.; Edge Moor Bridge Works, Edge Moor, Del.; Youngstown Bridge Co., Youngstown, O.; New Columbus Bridge Works, Columbus, O.; Wrought Iron Bridge Co., Canton, O.; Detroit Bridge Works, Detroit, Mich.; Chicago Bridge Works, Chicago.

THE West Virginia Steel Co., Wheeling, W. Va., manufacturers of roofing and ceiling, galvanized iron and steel sheets, was among the first to respond to the request of Secretary of War Root for supplies for the relief of Porto Ricans made destitute by the recent storms which swept over the island. The company shipped a car of roofing on receipt of telegraphic instructions fom the War Department.

G. H. GINTHER, special agent for Uehling's method of casting and conveying metals, has closed a contract with the American Steel & Wire Co. for the equipment of seven blast furnaces with the Uehling apparatus, the combined capacity of the furnaces being about 3,000 tons a day.

THE Campbell & Zell Co.'s boiler works, at Baltimore, Md., a new building 48x225 feet, containing machine shop, boiler shop, pattern room, and engine and boiler room, was sold at receiver's sale Sept. 5. The plant with equipment was purchased by Alexander Harvey, of Dietrick & Harvey.

AN Indianapolis dispatch says that the union molders at the Indianapolis Stove Works are out on strike to compel the unionizing of the works, which hitherto have been open.

LAKE SUPERIOR IRON MINES.

The deal by which the Oliver Iron Mining Co. acquires the Aurora mine, on the Gogebic range, is understood to have been concluded this week; and in this step the Carnegie-Oliver mining interest further establishes its position as the leading miner of Lake Superior ores. The Aurora ore is familiar to furnacemen, having been regarded for years as the choicest product of the Gogebic range. The mine is one of the Ironwood group and its purchase by the Oliver Iron Mining Co. gives the latter four properties in line, beginning with the Norrie and taking in turn to the eastward the East Norrie, Aurora and Pabst. Still farther east, in the Bessemer district, it has the Tilden mine. These properties produced 1,344,269 tons last year, but they could probably produce under extensive development and full operation from 1¾ to 2 millions a year. The Aurora was one of the Penokee & Gogebic Development Co. properties, but was operated in recent years, under reorganization, by the Aurora Iron Mining Co. Its shipments to the end of last year were 2,403,190 tons. The average analysis of last year's cargoes was 61.34 in iron, .028 in phosphorus, 6.72 in silica, and 9.77 in moisture. The most important work at the Aurora in recent years was the sinking of a new shaft, which was designed to secure the ore in the western portion of the mine. As at the Norrie the Aurora has considerable deposits under the dyke, which will make it a producer of good annual tonnages for a considerable period. It is understood that the new deal is a purchase of the stock of the Aurora Iron Mining Co. which has a lease of the mine.

A letter has been sent recently by an official of the company to stockholders of the Brotherton Iron Co., referring to a deal now working for the control of the property, and proposing to buy the stock at $1.25 a share. Recent sales are reported at $1.50 to $1.70. It is rumored that the American Steel & Wire Co. has an option on a controlling interest in the property.

Iron mining companies on the Marquette range have announced a voluntary advance in wages of 10 cents a day, taking effect Sept. 1. The increase affects both underground and surface men, numbering several thousands, with the exception of common labor on surface, which is advanced 5 cents a day.

J. Thoburn Gibson, whose recent ore find in Iron County, Mich., in section 15, 44 33 has been reported, has disposed of his interest to the Oliver Iron Mining Co. The new discovery is about two miles south of the Michigan mine, which is also in the hands of the Oliver people. This company now controls between two and three miles of mineral lands, extending south from Amasa, through most of which the Michigan ore formation is supposed to run.

By a recent deal in Iron County, Mich., lands, the surface and mineral rights to the lands of Chas. Hebard & Son, Pequaming lumbermen, pass to the Minnesota Iron Co.

Placer Gold Testing Machinery.—Within the last two years a machine has been developed by which old river beds and lake bottoms are explored for gold. Throughout the mountainous Western States there are many "buried rivers" and partially filled lake beds which have been long known to contain gold; but a method of determining the quantity and extent of the deposit has been lacking. These old water courses and lake beds are full of water, quicksands and various kinds of debris and wash. To explore them by means of shafts was found to be very expensive and tedious, and often impossible. The Keystone Driller Co., of Beaver Falls, Pa., has brought out a complete line of machinery for the above purpose and has put a great many of its machines into successful operation. A six-inch pipe is driven into the formation to be explored and the material taken up from the inside and assayed. A number of special appliances for taking up the gold have been invented so that even quick silver and amalgam can be readily recovered from the bottom of the hole. The machines are also adapted to go through any kind of rock. The gold is usually found on, or within a few inches of the bed rock and its great specific gravity keeps it at the bottom of the hole being drilled. Quite a number of large deposits have been discovered or proved up with these machines in Idaho, Colorado, California, Utah and South America. The expense of making a test is comprehended in the cost of fuel and water for a 10 h. p. engine and the labor of two men. One machine made 79 tests to bed-rock (an average depth of about 30 feet) in 24 days. The pipe driven is withdrawn after the test is completed and used over and over again.

The process is described, and the machine illustrated in an 8-page circular, which the company sends. It has been for many years engaged in the manufacture of water and oil well machinery, and zinc, coal, lead, and iron testing outfits, which are in use all over the continent. The Keystone Driller Co., was incorporated in 1891. D. McAllister is president, R. M. Downie, secretary and R. G. Forbes, treasurer.

OBITUARY.

Chas. L. Bailey, the well known Central Pennsylvania iron master, whose serious illness was referred to last week, died Sept. 5 at his home in Harrisburg. He was in his 78th year. Mr. Bailey was the founder of the Central Iron Works, and the Chesapeake Nail Works, of Harrisburg He first engaged in the iron business near Pottstown, where his father erected a rolling mill on the site of the Pine Iron Works. He was a partner of his father in business. In 1852 he went to Harrisburg and founded the Central Iron Works, in connection with Morris Patterson, of Philadelphia. Later he was interested with James McCormick in the nail works at West Fairview, and subsequently established the Chesapeake Nail Works. He was for a time general manager and treasurer of the Pottstown Iron Co., manufacturing nails, boiler plate, and pig iron. Mr. Bailey has always been prominent in civic life, having served in select council and legislature. He had been for a number of years president of the Central Iron & Steel Co. and the Chesapeake Nail Works.

Charles Y. Wheeler, the noted armor piercing projectile manufacturer, and president of the Wheeler-Sterling Stee Co., Pittsburg, died Sept. 5, in his apartments at the Pierrepont Hotel, New York. His death was due to heart failure. He was born in 1846, in Berea, O., where his father was president of Baldwin University for a long time. Mr. Wheeler entered Baldwin Univertsiy and remained until the Civil War began, when he enlisted as a bugler and served until illness compelled him to return home. He lived at Burlington, Ia., from 1863 to 1873 and was one of the proprietors of the Hawkeye. Later he went to Chicago and became connected with the Hays Steel Co. After remaining there a few years he went to Pittsburg in 1879 or 1880 and became general manager of the iron and steel plant of Hussey, Howe & Co., later changed at the death of Mr. Curtis Hussey to Howe, Brown & Co. At that time Mr. Wheeler organized the Sterling Steel Co., whose plant was located at Demmler. He was the president and practical head of the concern during its existence. He took up the work of producing armor-piercing projectiles in 1885, and in the next few years sent some 35 or 40 varieties of shells to the Annapolis proving grounds. In 1889 he sent to the Indian Head proving grounds a six-inch shell that pieced a 10½-inch plate. After this success the Sterling company received the first Government contract and filled an order for 100 six-inch shells. These proved unsatisfactory on account of the loss in breaking and hardening but he kept on, finally producing a shell that could be used with little or no loss. In the war with Spain his company received a $1,250,000 contract. Last year a partnership was formed with Sir William G. Armstrong & Co., of England. A large plant was erected there and the Sterling Co. participated in an equal division of the profits. In 1896 the original Sterling Steel Co. was amalgamated with the Thomas Firth & Sons firm, of Sheffield, Eng., combining the tool steel and projectile business, the American company reserving foreign rights and patents and ceding the same to a second company known as the Wheeler-Sterling Projectile Co., of which Mr. Wheeler became president, remaining in that position until his death.

Joseph Taylor, general manager of the Pittsburg Forge & Iron Co., Pittsburg, died Monday morning. He was connected with the company for 20 years.

THE Drake-Castle Pressed Steel Lug Co. has been incorporated at Chicago, with a capital stock of $20,000, to manufacture in steel and iron, by Samuel H. Wright, Alfred H. Castle and Adam Reichwein.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

DEVOTED TO MACHINERY, METAL-WORKING AND FOUNDRY TRADES AND IRON AND STEEL MANUFACTURE.

PUBLISHED EVERY THURSDAY BY
THE IRON TRADE REVIEW CO.,
CLEVELAND, OHIO.

CLEVELAND, 27 VINCENT STREET.
G. H. GARDNER, President. A. I. FINDLEY, Editor.

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1522 MONADNOCK BLOCK.
B. M. GARDNER, Western Manager.

PITTSBURG:
705 PUBLICATION BUILDING.
B. E. V. LUTY, Manager.
Telephone 1302.

Subscription (strictly in advance), $3 per annum. Foreign Rate, $4.
Advertising Rates Furnished on Application.

The Cleveland News Co. will supply the trade with THE IRON TRADE REVIEW through the regular channels of the American News Co.

ENTERED AT THE POST OFFICE AT CLEVELAND, O., AS SECOND CLASS MATTER

SEPTEMBER 14, 1899.

PHASES OF THE IRON ORE SITUATION.

The Lake Superior iron ore trade continues to be one of the most important factors in calculations as to the course of iron and steel markets in the next 12 months. Judging by statistics alone, it might be inferred from a movement of ore amounting to over 10,600,000 tons to Sept. 1, or 1,500,000 tons more than that of last year to the same date, that the supply will be ample for all needs. But those familiar with the unusually heavy shipment of stockpile ore thus far in the season, and the continued scarcity of mining labor, which has been accented in the harvest season, and with the more significant fact that definite notices of inability to fill contracts have been served by several producers, do not hesitate to say that the supply will be considerably less than the amount sold for this year's delivery. Estimates have been made giving shipments for they ear of somewhat above 15,000,000 tons. The current consumption of Lake Superior ores is known to be well beyond 16,000,000 tons.

As the season has advanced purchases of ore properties by large consumers of ores have been frequently announced. With all the activity in exploration and the reopening of long idle properties, the present season's developments have made no considerable addition to the possibilities of Bessemer ore production on the old ranges; and the policy of the large consumers of ores, of getting possession of properties in shape to produce largely, both in the year just ahead and in the more remote future, will speedily demonstrate its wisdom. Control of ores and control of coking coal are the keys to the future of the great companies. In both particulars their policy is sound and far-sighted.

In respect to lake freights the present season has been closely paralleled by the boom year 1895, and the comment quoted elsewhere as to the effect of high freights in driving ore mining companies and ore consumers into vessel ownership is quite apropos. Taking the cue from the course of the Rockefeller interest four years ago, iron ore and marine circles have been busy with speculation concerning the attitude of the leading miner and consumer of Lake Superior ores. Already negotiations for tonnage for grain-carrying for May, 1900, are reported, and the figure discussed is the equivalent of $1.30 on ore from Duluth. The probability of a season rate approximating that figure would certainly be a strong whip to vessel proprietorship. But ability to get new vessels in time for next year's trade is limited by the unparalleled congestion of steel works. In the case of the largest producer, this would not be an insurmountable obstacle, with its own mills behind it.

In brief, the outlook at this moment, so far as the coming year in the ore trade is concerned, is for high ore prices, high lake freights, larger ownership of mines and larger ownership of vessels by the great steel companies of the middle West.

The *Railroad Gazette* notes that in August its news columns mentioned orders for 12,661 new cars, of which 6,122 were box cars, 3,550 steel cars and 1,950 coal and gondola cars. In the same month 237 locomotives were ordered, or about double the number in any one of the three preceding months. The car orders more than doubled the 5,550 reported for July. Our contemporary comments on this marked increase, coming in the midsummer season, as highly significant, and so it is. Many of the cars now on order books will not be delivered until 1900; and in view of the assured return on the crops of 1899 there will be further large investments in rolling stock in the closing months of the year. One fact referred to by the *Railroad Gazette* should not escape notice. Last week it referred to inquiries for 8,000 freight cars, on which the prices quoted were so high that the railroads had concluded to postpone their orders. A check to railroad buying is an event of more than ordinary import, and should not be overlooked by those who would recognize the first signs of recession from the present over-strained conditions.

Personal.

President E. H. Gary, of the Federal Steel Co., has returned from Europe.

Henry W. Hartman, president of the Hartman Mfg Co., of Elwood, Pa., returned last week from a short business and pleasure trip to Europe, improved in health.

W. B. Jones, of Youngstown, O., has acquired an interest in the Enterprise Boiler Co., of that city, and will have a part in the active management of the company.

A. S. Matheson, general manager of the National Tube Co., has annouced a number of appointments for the Youngstown department. W. L. Kauffman has been made manager, and William D. Matheson has been appointed superintendent of the mill. W. E. Camp has been advanced to the position of paymaster and cashier, and George Matheson will be assistant manager.

Adolph Hertz, one of the directors of the Krupp Works, at Essen, Germany, was in Pittsburg last week, leaving for Chicago. He expects to spend a week in Pittsburg the latter part of the month. Mr. Hertz is making a thorough study of American processes in iron and steel manufacture.

It is expected that General Manager Gilbert M. McCauley will succeed the late Charles L. Bailey as president of the Central Iron & Steel Co., Harrisburg, Pa.

Job Hartley has resigned as assistant superintendent of the Carrie blast furnaces of the Carnegie Steel Co., at Rankin,

Pa., to become assistant to W. A. Fuller, manager of the Lorain Steel Co.'s furnaces at Lorain, O.

Dr. Wm. B. Phillips, who has returned from a trip of several weeks to Cuba, for the examination of ore properties, has resigned as editor of the *American Manufacturer*, of Pittsburg. Dr. Phillips has established offices at 59 Ninth st., Pittsburg, and has resumed professional work as chemist and consulting engineer in the metallurgy of iron and steel.

Union Steel Chain Co.

We have noted the fact that several of the companies announced by the projected Union Steel & Chain Co., of New York, as under option to it have denied that options were out. In a few cases it is admitted that valuations have been named in reply to inquiries by the promoters, but it is a disputed question whether such a statement in writing, acknowledged by the agents of the proposed company, can be construed as constituting an option. The Union Steel & Chain Co.'s representatives have been very confident in their claims. Their statement puts forward the following as financial directors: Perry Belmont; James W. Hinkley, president United States Casualty Co.; Thomas S. Holmes, banker and member of New York Stock Exchange; Henry W. Poor, banker and member of New York Stock Exchange; H. L. Horton, banker and member of New York Stock Exchange; Frank Rockefeller, vice-president of Standard Oil Co.; William Rotch, Boston capitalist and director of the Atchison, Topeka & Santa Fe Railroad.

The following letter sent last week to a Pittsburg company which has been asked to go into the consolidation is of interest. It is on the letter head of "E. L. Harper & Son, Iron, Steel, Coal, Ore, Empire Bldg., 71 Broadway, New York."

"Dear Sirs:—Steel and iron stocks are now very popular in Wall Street. The public is clamoring for the issues of the large companies, and the common and preferred combined are all selling above par, with indications of higher prices. For instance: American Steel & Wire is equal to 158 for both issues; American Tin Plate, 133 for both issues; American Steel Hoop, 123 for both issues; Federal Steel, 142 for both issues; National Steel, 154 for both issues; Tennessee Coal & Iron, 245 for both issues; Republic, 107 for both issues; Union Steel & Chain Co., 105 for both issues. We believe candidly the Union Steel & Chain Co.'s stock will pass 150 within the next six months, for the reason that the accepted plants are diversified, which will more fully guarantee dividends than one single line that may have months of very dull business. Yours truly,

"E. L. Harper & Son."

The Bertrand-Thiel Process. [*Engineering and Mining Journal*, Sept. 2.]—Prof. Henry M. Howe writes an article to explain the rapidity of this process. The process consists essentially in melting the cast iron in one furnace, simultaneously melting the available scrap in another lower down, adding the ore here. In the first furnace the silicon and some phosphorus is oxidized and removed; in the second the scrap is heavily charged with oxygen. The contents of the first furnace is tapped into the second, minus its slag, the charges mix and the carbon is removed very rapidly. The fact that the moderately basic slag from the upper furnace is removed after much of the phosphorus has left the iron means a smaller quantity later on, hence much less time is needed than if the operation were carried out in one furnace. The total quantity of slag per ton of iron in the Bertrand-Thiel process is less than in the regular method. This means more room in the furnace, or a greater output. Again, the smaller quantity of slag means a thinner layer with better fuel economy and time saved. A further point is the action of oxides. In the usual process, ore is added, which means silicious gangue to be neutralized, thus forming large quantities of slag. In the Bertrand-Thiel process a great part of the oxide required is formed by an oxidation of the scrap iron in the lower furnace. Since in the mixing we do not start with cold pig iron and scrap, but at very high temperatures, the reaction under these conditions is very rapid and effective; the end temperature is consequently very much higher in this process. This point is an important one, for it explains why the furious boiling of the relatively colder and more viscous melt in the ordinary process by adding ore quickly is not found in the mixture of the two hot baths of the Bertrand-Thiel process. A hot and thin bath will not boil as violently as a colder and more viscous one. Prof. Howe therefore concludes that the points of advantage of this process are the greater room afforded by the metal during the melt, the higher temperature due to preheating the pig and scrap separately, and the greater fluidity of the bath resulting from less slag and possibly a larger ratio of iron oxide to lime in the slag. M.

AMERICAN LOCOMOTIVES IN GREAT BRITAIN.

In general appearance the American locomotives that have been supplied to the Midland Railway Co. are not much unlike ordinary British engines, but the British schoolboys who have been so anxiously on the lookout for them will seek in vain for the bell-mouthed smokestack, the cow-catcher, and the huge lamp in front, which they have always regarded as the leading features of an American locomotive. They are conspicuous for their absence, for the simple reason that they are not required. In Great Britain wood is not used as fuel for locomotives, the cows are fenced off from the railway, and we have not to light up street level crossings by the aid of lamps carried on the engines.

Notwithstanding these important omissions, however, the construction of the American engines differs widely from the British. In some respects it was specially stipulated that the Midland practice should be adhered to in the engines supplied to the company. For instance, the inside fire-box and tubes were to be of copper instead of steel, and the wheels, injectors, steam sanding apparatus, water gauges, and smoke-box doors were to be of Midland design and fitted with the combined steam and vacuum brake used on the Midland Railway; but with these exceptions it is difficult to find any similarity between the American mogul engines and our own locomotives. The frames, instead of being made of stee plates, one inch thick and 18 inches deep, or thereabouts, with chilled iron axle guards bolted to them, are the bar frames so extensively used in America. They are formed of two longitudinal framed structures, one on each side of the engine, connected and stiffened by transverse bars and plates.

A distinguishing feature of the mogul type of engines is the pony-truck which carries some of the weight at the leading end and serves to guide and steady the engine when passing over sharp curves. It is an ingenious device, with a swing bolster on which the central pivot rests, and spiral springs supporting the truck on the axle-boxes. The truck is connected to a triangular frame radiating from a vertical pin in advance of the coupled wheels, by which means the twist of the pony-truck is kept within bounds.

As a rule the weight of a locomotive built for British railways is so distributed over the axles that each spring bears its own weight unaided. The American practice is to link the springs on each side of the engine with each other by intermediate levers, so that if when running over a bad bit of road any extraordinary weight is suddenly thrown on one pair of springs, part of the burden is transmitted to the springs of the neighboring wheel which helps to support it. In the case of the moguls the weight between the driving and trailing coupled wheels and between the leading coupled and the pony-truck wheels is thus equalized.

Some British engineers have criticized the lightness of the valve motion, but this is accounted for by the fact that balanced valves are used, which relieve the strain on the working parts. The cab on the American engines is much more roomy than those generally seen on British engines. It has two windows on each side, and a door with glass panels on either side in front. The driver can open these doors and pass along the foot-plate outside to oil the machinery while the engine is running. The sand box on the top of the boiler, which has the appearance of a second dome, is fixed between the chimney and steam regulator dome. It holds a large quantity of sand, which, owing to its position, should be kept dry, but, being so high up, it is awkward to fill. In America the difficulty is overcome by erecting a high stage outside the running shed, to which the engines are taken to receive their supply of sand.—[Charles H. Jones, in Cassier's Magazine for September.

THE IRON AND STEEL STOCK MARKET.

Denison, Prior & Co., Garfield Bldg., Cleveland, in their weekly letter on the iron and steel stocks say: "'Money on railroads 6 per cent, no loans being made on industrials,' was the tenor of a despatch received by our wire on Monday. Messages of this kind have that same familiar ring that was noticeable in the 'discrimination-against-industrials' slump in the earlier part of the year. Of course, a money loaner can lend money upon whatever security he pleases, and has a perfect right to refuse to make loans upon securities that are offered to him as collateral. This does not alter the fact, however, that many of the iron and steel stocks are as good as collateral, intrinsically, as a large number of the railroad issues. The character of the money market was such on Monday, that there was a general decline throughout the entire list. The greatest decline was noticeable in the industrials. Preferred issues suffered in almost an equal proportion with common shares. Authorities in the East say that this condition in the money market will continue to exist until after Oct. 1, and that it can only be relieved by the Government anticipating payments which are due at that time, as it did during the stringency existing last year.

"It was rumored on Monday that Secretary Gage had been interviewed on the subject of making some effort to relieve the money market and that he had said that while he would be willing to recommend measures being taken to relieve a stringency that would effect industry in general, he would not recommend any measures to be used merely for stock jobbing purposes. No matter what the cause of the present situation has been, the effect has been that a general decline in the iron and steel stocks resulted. There have been two exceptions to this movement—Tennessee Coal & Iron and Colorado Fuel. These two stocks maintained the greater part of their rise, which has been phenominal, and sold on Monday at prices very close to their high record marks. It is said, that insiders in Tennessee Coal & Iron freely predict that it will sell at 200 before many months are past, and if they desire to see it sell at that point, there is no reason why their wishes should not be gratified. It is in their power to place the quotations for the stock at any point they see fit to put them.

"The rise in prices for these stocks is not the result or the reflection of legitimate conditions. This was fully demonstrated by the action of Tennessee Coal & Iron in the fact of the downward movement of the other iron and steel stocks on Monday. The movement in Colorado Fuel & Iron has been practically unexplained up to the present time. Some of its friends assert that it is but a true reflection of the prospects of the company; others, that it is a result of manipulation, and that the rise is a very unhealthy one. One authority says that investments in either Tennessee Coal & Iron or Colorado Fuel at present prices will be far more permanent than profitable. All authorities agree, however, that the stocks had far better be let alone than traded in by anybody but insiders."

Fluctuations of the Week and the Year.

The following table shows the fluctuations in iron and steel stocks in the week ending with Monday, Sept. 11, and in the present year:

Name.	WEEK.				YEAR.			
	Open	High	Low	Close	High.		Low.	
Am. Car & Fdy.....	17	19⅛	17	17⅜	21⅞	May 25	15	June 15
Am. Car & Fdy pr.	65¼	68⅞	59⅞	65	68¾	Sept. 7	56⅜	June 16
Am. Steel & Wire,.	57	58½	54½	54¾	72	May 4	45	Feb. 8
AmSteel & Wire pr	99⅞	99⅞	97⅞	97⅞	106¾	Mar. 13	92½	Feb. 8
Am. Steel Hoop.....	38½	41¾	38½	40⅞	41¾	Sept. 8	24	May 24
Am. Steel Hoop pr	84½	86½	84	85½	86½	Sept. 7	70	May 13
Am. Tin Plate.....	42⅜	44½	40	40⅛	52¾	April 4	33	May 24
Am. Tin Plate pr..	90¼	90¼	89	89	99⅜	Feb. 8	81	June 1
Col. Fuel & Iron...	57	64	51	60½	64	Sept 11	30½	Feb. 8
Federal Steel.....	60⅛	62⅝	59¼	59⅝	75	Apr. 3	46⅜	Feb. 8
Federal Steel pr....	81	83½	81	82	93¼	April 3	72½	May 13
National Steel.....	55⅜	58⅞	51¼	51¾	63	April 24	43¾	June 1
National Steel pr..	98½	98⅞	97	97	99⅜	Aug. 11	85	May 25
Pressed Steel Car..	59⅛	60	59	59	61¼	Aug. 15	44¾	June 1
PressedSteelCar pr	90½	90¼	89½	90	90¾	Sept. 8	78	May 25
Republic Steel.....	30½	33⅞	27½	28	33⅞	Sept. 6	22¾	Aug. 28
Republic Steel pr..	78¾	79	73½	74	79	Sep . 1	73½	Sept 11
Tenn. Coal & Iron	99½	126	99	121⅛	116	Sept 11	36	June 14

Notes.

The American Car & Foundry Co., in an official statement gives its net profits for five months from March 1 to July 31 at $1,238,588. The earnings for the entire fiscal year, calculated on the basis of the monthly average of the five months' period are estimated at $2,973,000. Deducting the full seven per cent dividend on the company's preferred stock (calling for $2,100,000) leaves a surplus of $873,000 for the common stock, or nearly three per cent. Orders were received in August for about 6,000 cars. The company has declared a dividend of 1¾ per cent on its preferred stock payable Nov. 1.

At New York, Judge Thomas, of the United States Circuit Court, signed an order modifying the injunction in the case of Frederick F. Marquand vs. the Federal Steel Co., permitting the defendant corporation to pay dividends on its preferred stock. The by-laws of the company were amended to meet the requirements of the New Jersey laws, and on Tuesday, Sept. 12, the dividend was declared.

The National Steel Co. has declared its second quarterly dividend of 1¾ per cent on the preferred stock, payable Sept. 30. Books close Sept. 20.

A METHOD OF CLEANING BOILERS.

It is reckoned that boiler scale ¼-inch thick adds 25 to 40 per cent to the fuel bill. In a general way power users appreciate that scale also greatly impairs the efficiency and life of a boiler and adds to the cost of repairs. Mechanical and chemical means of scale removal have been developed and much talent and capital have been attracted to this field. For water tube boilers a cleaning device is manufactured by the Chicago Boiler Cleaner Co., 828 Monadnock Block. The machine is attached to the end of a strong rubber hose and driven by water or air pressure. This pressure causes the

turbine to revolve with great speed and power throwing the heavy cutting arms of the flexible head outward by centrifugal force against the scale with sufficient power to cut and pulverize it into powder, which the flow of water washes away. The machine contains a specially designed water turbine which developes high power. An instance is cited in which this machine removed more than 16,000 pounds of scale from a boiler which it was claimed was practically clean. For tubular boilers both mechanical and chemical means are often necessary, and in the use of the latter an analysis of feed water or scale is necessary, so that a preparation may be made, particularly adapted to the case.

Received from the Trade.

Jones & Laughlins, Ltd., Pittsburg, have just published a new catalogue and price list of their patent cold rolled shafting and other specialties, including power transmission material. This firm was the pioneer in cold-rolling, having been engaged in it for more than 40 years. In this time it has built many special machines for the work. It manufactures cold-rolled shafting, piston rods, pump rods, engine guides, etc. from homogeneous steel. The preface to the catalogue says: "Each process of the manufacture, from the mining of the ore to the finishing of the product, is conducted in works owned and controlled by ourselves, and under the personal supervision of a member of our firm, with a view to producing an article of as high grade, uniformity of structure and exactness of finish as it is possible to obtain; and, at the same time, of such softness and ductility as to admit of its being worked as easily and cheaply as iron, and with as little wear of tools". The book before us contains a vast amount of detail concerning pulleys, hangers, pillow blocks and other transmission equipment. The cold rolled products of Jones & Laughlins, Ltd., are described fully and results given of tests to determine the effect of cold rolling upon the inner portions of bars. The work is bound in flexible cloth.

A recent circular of the Star Corundum Wheel Co., of Detroit, contains testimonials from users of Star emery wheels.

"Steamboating on Shallow Rivers," is the title of recent literature of the Marine Iron Works, Chicago, illustrating the type of small steel steam boats built by this company. The delivered price ranges from $2,100 to $2,300, the boats being 37 feet long, 10 feet wide and 4½ feet high, with gross shipping weight of 9,800 lbs.

ROD ROLLING AND ITS DEVELOPMENT.*

BY N. E. TURNBULL.

There are probably few outside of those actively engaged in the wire trade who are aware of the very large percentage of the total steel product of the world that is absorbed to-day in the manufacture of wire rods. The finished product is met at every turn—in wire fencing, barb, plain and netting, telegraph and submarine cable wires, railway signal wires, cable and trolley tramways, ropes of all shapes and sizes, bottling wires, mattresses and sofa springs, gun wires, pins, needles, bicycle spokes, piano wires, and in many other forms too numerous to mention. It is estimated that no less than one-fifth of the total steel product of the United States of America is made into wire rods. The newly consolidated wire interest in that country uses about 5,000 tons of billets per day for rolling into rods.

It is perhaps somewhat difficult at the present day to clearly define a wire rod, because plants are now in operation which are cold drawing bars in rounds, squares, or hexagons, etc., up to 2½ inches in diameter, and it is difficult to say that any practical limit can be set on what it is possible to draw cold. The remarks that follow will, however, be chiefly confined to the rolling of rods under one-half inch in diameter. Little alteration or improvement was made in rod rolling until 1860, up to which time the practice was to reduce the billets in sectional area in a separate mill to a 1¼ inch or 2 inches square, when they were re-heated and passed to and fro through one stand of rolls with the necessary grooves cut in them. The output varied from three tons in 1830 to about five tons in 1860, and the weight of pieces from 10 lbs. to 25 lbs. at these respective dates, the material used being puddled iron.

Bedson Continuous Mill.

About the year 1860, a demand for long pieces of wire without weld, for telegraph and other purposes, became general, and to meet it Mr. George Bedson thought out, patented, and perfected the continuous mill, with which his name is so closely connected. It was certainly, at that time, a triumph of mechanical ingenuity and indomitable pluck. The great stride made will be apparent when it is noted that it is a perfectly feasible operation in this mill to roll a No. 8 rod, .160-inch diameter, weighing a ton, in one single piece, i. e., having a total length of about 6½ miles; in fact, it became a necessity to have the billets in as long lengths as conveniently possible, so as to minimize the chances of "break outs" between the rolls.

Naturally, Mr. Bedson encountered many difficulties in making his mill a success, but finally succeeded, and by 1867 the product of the mill had gone up to 11 tons per day, and the weight of pieces had increased from 25 lbs. to 100 lbs.; the waste had been reduced from 10½ per cent to 6 9-10ths per cent, and the consumption of coal from practically 15 cwts. to 8 cwts.; whereas to-day one of the original of three mills put down by Mr. Bedson (naturally somewhat modified), can turn out 40 tons per single turn, and works on a yearly average of waste (furnace waste, cobbles and ends) of 2¼ per cent, rolling 340 lb. pieces in single lengths. The mill is to-day a surprise to many, and to none more so than to those expert in rod rolling. The whole mill, which was never built to roll steel, looks so slim, the rolls, roll necks, and wobblers are so small, that one wonders it does its work. Mr. Wm. Garrett, than whom there is no greater authority on rod rolling, only quite recently expressed the conviction on being shown the cost-sheets, that this mill, taking it from billet to rod, produced the cheapest rods in the world. Besides the mills erected on this principle at the works of Messrs. Richard Johnson & Nephew, in Manchester, a mill of the same type built in England was at an early date put down at the Washburn & Moen Co.'s works, at Worcester, Mass.

Automatic Rod-Reeling System.

From the year 1870 forwards it is difficult to give a correct chronological account of the development of rod rolling. Two systems began to compete in America for pre-eminence, viz., the continuous of Bedson, developed by Messrs. Daniels and Morgan, and the looping or Belgian system, brought to its present perfection by our countryman, Wm. Garrett.

To cope with increasing outputs, one of the first necessities was a method of quickly and safely reeling or coiling the product. When the outputs did not exceed 10 tons per turn, the reels were operated by hand, first by a lad and afterwards by a man; but as they increased to over 20 tons, resort was had to mechanical power in various forms. The rods were led by a pipe from the last rolls, and as they issued therefrom a lad guided and laid the rod on an open floor, the end being picked up by another lad and put into the power reel, which then gathered the slack from off the floor, the speed being kept under control by a friction-brake or some such device. As the finishing speeds and the outputs increased, this method, besides being dangerous, was found to be wholly inadequate to take charge of the possible outputs, and the automatic reel was the outcome of this necessity. These were brought to great perfection by the efforts of Messrs. Morgan and Daniels, later reels emboyding the same principles being those of Edenborn and the Garrett-Cromwell reel, which has only recently been patented, and is a very clever device.

Automatic reels are of two distinct kinds, viz., pouring and receiving reels. The action of each is, however, identical, and depends on making the circumferential speed of the coil being formed equal to the linear speed of the rod as it leaves the rolls, the result being equilibrium or rest, any little inequalities in the relative speeds of delivery and revolution of reel being compensated for in a slight difference in diameter of ring formed, which is perfectly automatic, a relatively increased linear velocity finding rest in an increased diameter of coil. As between the advantages of each system there is not much to be said, especially if only round rods are dealt with; however, if sectional rods are being rolled, the receiving reel is preferable, if not absolutely necessary as the pouring reel puts a twist in the rod in laying it down. It is claimed as regards round rods that the twist is advantageous in the drawing. The automatic reel enabled the continuous mill to be run very much faster, so that to day some finishing rolls are running 1,200 revolutions per minute, and producing rods as fine as No. 9 gauge, equal to 0.144 inch in diameter; but the continuous mill, with its alternately horizontal and vertical rolls, could not take charge of more than one rod at a time, so recourse was had to putting the rolls all horizontal, which necessitated the turning or twisting of the piece as it passed from one roll to another through an angle of 90 degrees, this being accomplished by means of the guides. The twisted guide was invented and first used by Mr. Bedson, but its ultimate success was more directly due to Mr. Morgan. Two objects were accomplished by this—first, the underground gearing was completely done away with (this has always been a nuisance, being out of sight and subject to the water and scale from the mill overhead falling on it); secondly, by allowing the rolls to be made larger enabled parallel lines of rod to be rolled simultaneously, as at the Washburn & Moen Co.'s plant at Waukegan, Wis., under the superintendence of Mr. Daniels, four parallel lines are successfully run, producing 400 tons of rods in one day of two turns of 10 hours each.

Reverting to the looping or Belgian mill, the most modern examples of these are now universally known as the Garrett mill. The first advance made on the old system of passing the bar right through and returning the last end was the turning in of the first end as soon as it became pliable; this simple change by saving time and heat increased the output.

The First Garrett Mill.

The next step was the rolling of two rods at once in the finishing rolls. About this time Mr. Garrett conceived the feasibility of rolling four-inch or five-inch square blooms directly into rods, i. e., without a subsequent reheating. This he considers the greatest advance ever made in rod rolling; but he had not an opportunity of developing his ideas until 1882, when he prevailed on the Cleveland Rolling Mill Co. to put down a mill known as the first Garrett rod mill. The first mill was a success from the beginning, and the average of the third month's working showed an output of 72 tons per day—double what had previously been accomplished.

* Read before the West of Scotland Iron and Steel Institute.

Naturally, such a result attracted great attention, and many more similar mills immediately followed.

These mills were at first worked with two rods only in the finishing rolls, but the introduction of the McCillip repeater for turning the squares enabled two to be rolled simultaneously from the finishing squares, the repeater turning the finishing squares into the ovals, and as it became possible to bring forward more material the repeaters were put on further and further down the train, and then it became an easy transition from two, to first, three, then four, until to day five and six rods are generally in the finishing rolls at one time.

The McCillip repeater was a most ingenious device, and cetrainly went far to render the present outputs possible on this class of mill. A double repeater was designed by the author, so as to keep the rods entirely free from each other. This, however, is unnecessary. In America the repeaters are all in one plane. The piece coming from the square rolls enters the repeater, and is carried round until it strikes and enters the oval rolls, then, as these rolls do not take the material as quickly as it is delivered from the squares, it gathers and can only free itself by coming out of the repeater. By means of these repeaters all manual labor, as regards turning in of the piece, is done away with on the squares side of the mill. It may be asked why repeaters are not used on the oval side also? Well, practical rollers know that the guides for a square may be left comparatively free, and that a square adjusts itself naturally, whereas the guides for an oval must be tight to hold the oval with its longest axis vertical, the slightest turning down of the piece being fatal to good rolling. It has always been considered that automatic turning in of the ovals did not pay on account of the scrap made. They are, however, in successful operation in this country, and the author has the designs of a double one for a mill, but unfortunately has not permission to publish them.

We have, however, somewhat anticipated, as previous to the introduction of rolling two rods at a time, the floors were level, and hook-boys held the loops at their full length. When two loops came this was not only dangerous, but almost impracticable. Recourse was therefore had to sloping the floors on both sides of the mill, so as to let gravity take care of the extending loops. This enabled lads to be dispensed with altogether on the repeater side of the mill, though they are still retained on the oval side to prevent cobbles, should there be any unnecessary delay in getting the piece in. The sloping floor was first put in practice by Henry Roberts, of Pittsburg.

The introduction of the automatic reel to these mills was contemporaneous with its use in continuous mills, and became an absolute necessity when two rods were rolled at once. Most of the automatic reels at present in use, where there are large outputs, are so arranged as to deliver the coils of rods on to a conveyor, which takes them to the railway wagons if for shipment, and to the cleaning-house if for drawing into wire. The conveyors are carried round the yards and are of a sufficient length to allow of the coils being thoroughly cooled before being loaded and tied up, and in many instances in America this is the only time the material has been cold from the time it left the blast furnaces, and, in some instances, the only time the material has been touched by human hands.

Improvements at the Furnace End.

Naturally, along with the improvements in rolling and coiling, and the conveying of the product away, there has been a corresponding development at the feeding or furnace end, so much so that two furnaces, when charged with hot billets, easily keep a mill going at 400 tons capacity per day. The billets, four inches square, are brought up on bogies to the furnace, and are charged by an hydraulic pusher one at a time, usually in two separate rows, until the bed of the furnace represents one solid mass of metal; then, as the billet is pushed in at the charging end, one is pushed out at the other end on to a continuously moving conveyor, which takes it to the first rolls of the mill. The billets travel towards the hottest part of the furnace on the top of water pipes, raised slightly from the bottom.

So far, it has been assumed that the stock used by these mills has been billets rolled down from ingots of large size. It is, however, a practice in Germany to cast small ingots, the equivalent of billets, in suitable molds, the metal being run in from the bottom. These ingots weigh from 1 cwt. upwards. The group of ingot molds is arranged to receive the whole cast of a five-ton converter—say 48 ingots of 2 cwt. each. The molds are closed at the top, with the exception of a small hole to take off the gases. The ingots are said to be very perfect, having rarely bad tops, and are perfectly suited for being rolled directly into wire rods. It is claimed that as much, if not more, work is put on these ingots in reducing them to wire rods as is put on a 100-lb. rail reduced from a large ingot. Personally, however, the author prefers starting with a sound billet to a porous ingot, and he has little doubt that the product of the first is more reliable.

The plan of casting from small ingots has, however, one great advantage, that of making the rod producer independent of the steel works, who, in times like the rpresent, give the poor billet consumer small courtesy either as to price or deliveries.

Some Examples of Modern Mills.

Having briefly described the more salient features of rod rolling, which have conduced to the present enormous outputs, your attention is directed for a moment to some of the more modern examples.

The mill being built for the Shoenberger Steel Co., of Pittsburg, Pa., takes 5-inch square billets, about 320 lbs in weight, which after two passes is reduced to 3⅞ inches square, when it is cut into two by shears lying midway between the second and third sets of rolls. The continuous train has four sets of parallel passes, the after manipulation being as described in the preceding example. The number of men required to actually operate this mill, the billet or bloom being delivered at the charging end of the furnace, is as follows: Four men on heating furnaces, of which there are two for cold steel and one for hot steel billets; one man to shear billets in two; one man to take care of continuous train; one boy to operate switch between the sixth and seventh passes; five turners-in; two hook-boys to attend to oval loops; one boy to operate reels; one man to take care of coils at reels on conveyor; one man to take off conveyor; six common laborers to deliver rods into cars; one head roller, or a total of 24 hands. The output of this mill will be between 350 and 400 tons every 24 hours.

Another mill which should prove of interest is specially desgined to make wire rods and small merchant steel sizes ranging from ½-inch up to 2-inch rounds or squares, flats 1 inch wide up to 3 inches, also any small angles, tees, or irregular sections, that will weigh above 1 lb. per foot. A 4-inch billet is used. The continuous mill is from 14 inches to 16 inches diameter, and feeds into a 12-inch train of five sets of rolls, at which you stop when making merchant steel and when wire rods continue to the end. The mill is driven by one engine, and is in every way very compact.

The mill patented by Mr. Boecker, Schalke, Germany, consists of two trains of rolls placed parallel with each other, and are speeded with such suitable gearing as to take up the increased length of the rod as it passes from one set of rolls to the opposite parallel pair. By having the oval sections between the rolls and the squares on the outside this mill by the use of repeaters can be made as automatic as the continuous mill, while at the same time there is no pull on the piece in the squares, and the section between the roll is well under observation. Mills on this latter system are in active operation in the States.

In all of these mills the continuous principle is made use of to a greater or less extent. In the Garrett mills the roughing down is done in a continuous mill. In the so-called continuous wire rod mills this is simply carried throughout to a finish, there being little or no looping. In the Morgan continuous mill at the Joliet works of the Illinois Steel Co., they start with a 1⅝-inch square billet, which is made on the continuous roughing train of the mill already described. The Bedson mill at Middlesbrough, which is the most modern continuous mill in this country, should also be mentioned. The rolls are all horizontal, there being a break at the eighth pair. Only one rod is rolled at a time. The finishing rolls run at about 700 revolutions per minute. The billets are two inches square, 28 feet long, and weigh about 360 lbs. The percent-

age reduction is from 25 to 30 per cent reducing to ovals, and 15 to 20 per cent reducing to squares. About 1,000 indicatde h. p. is required to drive the mill.

Combined Continuous and Garrett Mill.

The mill and plant designed by the author for Messrs' Richard Johnson & Nephew, of Manchester, is a combination of the continuous and Garrett mills, and is in some respects unique. The billets used are 26 feet long, two inches square, and are rolled without cutting into No. 6 rods.

The roughing mill consists of 11 stands of rolls alternately horizontal and vertical. The vertical roll housings are new in that the drive is from the top downwards, through a pair of pinions and ordinary spindles and boxes, and not upwards, as has always been the case previously with vertical rolls; this, of course, keeps the gearing in sight, and, at the same time, free from scale and water. All the objections to the old style of vertical housings are completely overcome, and where it is intended to roll only one rod at a time, the author considers this arrangement more satisfactory than all horizontal rolls and using twisted guides, as there is no wear on the guides. Suitable closed guides in halves are carried between each pair of rolls for conducting the piece to the next rolls. The top part of the guides is held only with sufficient force to guide the piece, any excessive pressure frees it and lets the bar come out at that place, such as might happen if a roll neck spindle or box broke. The first roll has about 14 revolutions per minute, and each roll is speeded from that to take up the increased extension produced in the bar by the preceding rolls, so that No. 11 rolls go at over 200 revolutions per minute. The first billet went through this roughing mill without a hitch, and no alteration has since been made in any of the gears, or even to the 1-64th inch in the diameter of any of the rolls, so that there need be no fear on the part of any one of putting down continuous mills, provided careful attention is given to the speeds and reductions. There is naturally a little elasticity in the draught which the attendant may put on at each roll; it, however, takes no inconsiderable amount of skill to thoroughly manipulate this part of the mill.

The finishing train consists of nine stands of rolls arranged for looping, but every pass speeded up so as to keep the loops as nearly stationary as possible; thus the section is kept good and free from any pull by the rolls. By keeping the loops nearly stationary, the rod travels in such a class of mill the shortest possible distance to the reels, so that there is no difficulty in rolling long lengths in single pieces. Every alternate two pair of rolls are driven through three high-pinion housings by gearing from the second motion shaft, which runs the whole length of the train, the rolls being alternately 9¼ inches and 10⅝ inches in diameter. On the square sides of the mill the automatic repeaters are entirely used. As the piece comes from the roughing train it is caught at the finishing train, where three or four inches of the first end being cut off at the shears, so as to have a good end, it is entered at No. 12 rolls, and then alternately travels round the repeaters, and is caught by the turners-in until it arrives at the coilers, where it is automatically reeled. The roughing train is so speeded up as to necessitate the rolling of two rods at once in the finishing train at certain times. The coil of rod was rolled from a billet without either the first or last end being cut. The loss in weight is purely furnace weight, and is under 2½ per cent. When fully loaded it requires 1,250 h. p. to drive the mill, which is done by a Corliss cross-compound jet-condensing Galloway engine.

The furnace for heating the billets is 27 feet long by 12 feet broad, with 33 alternate gas and air ports on each side and regenerators underneath. The gas valve is on the floor, suitable for access, and is of the circular water seal type. The air valve is of the ordinary type, and is underneath. There are separate flues and dampers from the gas and air regenerators to the main flue, so that the regenerator temperatures can be regulated as required. Gas is supplied, from two circular water-bottom gas producers with Duff patent grate, by an overhead brick-lined iron tube, coal being fed into hoppers direct from the wagons; by means of a sliding shutter the gas man regulates his charges.

This mill has a capacity of from 75 to 80 tons of No. 6 rods per day of 10 hours, the percentage of scrap made including furnace waste for the last six months being under four per cent. The number of men employed in the delivery end of the mill is:—

One furnaceman, who enters billets in first roll.
One guide cleaner in charge of roughing train.
Four turners-in on oval side of finishing train.
One roller.
Two hooker lads taking charge of oval loops.
One man manipulating reels and taking product away.
Total, 10 men and lads.

The percentage reductions in this mill are light. Whereas the modern American practice in reducing from a four-inch billet to 9 16th inch square is a uniform reduction of 40 per cent reducing squares to ovals, and of 30 per cent ovals to squares, before they equalized their reductions and were working at random they sometimes got as high as 48 per cent reducing squares to ovals.

Relative Advantages of Continuous and Loop Mills.

Comparing the advantages of the two systems of mills in use, viz, the continuous and the looping, the chief points that call for notice are, first, that the continuous mill saves enormously in the coal bill for steam—certainly all other conditions, such as size of billet, number and percentage reductions, etc., being the same—to the extent of about one-half. This is readily understood when it is remembered that the work in a continuous mill is put on so quickly. From the time of entering a two-inch square billet until the first end is reduced to a No. 6 rod only some few seconds elapse, the mechanical work put on the rod enables it to retain its initial heat, even though streams of water are poured on the rolls all the time. It will also be readily seen that the loss from scaling is considerably less in the continuous than in the open mill; there is also a considerable saving in the labor cost, although when compared with the most modern type of Garrett mill, with its large outputs, the comparison is more equal.

Also it is well worth bearing in mind that where uniformity of quality is necessary the continuous mill has certain advantages, because there is little or no difference in the heat at which the first and last end of a long piece are finished, whereas in the looping mill, if long lengths are tried, the difference may be considerable, thereby causing molecular and physical variations in the product.

The only drawback to the continuous mill is the inferior quality of the rods produced as regards section, the various sections are not so completely under control as in an open mill, there is always a fin of a yard or two on both ends of a coil of rod from a continuous mill, which has to be cut off before the rods can be drawn, and becomes scrap; it is not, however, a heavy percentage of the total length; this class of mill is also not so well adapted for easy and quick changes to roll different gauges or sections. There is a continuous mill at Joliet, designed by the Morgan Construction Co., producing large quantities of flat cotton bale ties. Undoubtedly, for quick roughing down, nothing can compare with the continuous mill, and as long as the section is large—say to one-half inch square—there is little trouble, but after that it is preferable, especially if frequent changes of gauge are required, and an absolutely regular satisfactory product is wanted, to revert to looping. The continuous mill ought to have a great deal more extended use in this country for quick roughing down.

As between our practice and American, leaving out of count the question of large outputs and labor-saving appliances, the most notable feature is no doubt the use of the four-inch billet, as against our two-inch or two and a half inch. The four-inch billet has been described by a prominent American as the greatest invention of the age, and no doubt has contributed greatly to the large outputs; it has many advantages over the lesser section, not least being the diminished cost. In America this amounts to 4s. per ton. In this country at present it is not possible to get any benefit on this score, at least such is the answer received to an inquiry addressed to half-a-dozen steel works. If 4s. is a fair estimate of the difference in cost to produce a four-inch as against a two-inch billet under proper conditions, and there is no reason to doubt it, it behooves makers to keep the same steadily in mind when designing new mills. The extra

cost of rolling in a rod mill is very slight when it is considered that a two-inch billet can be reduced to a No. 6 rod, with an expenditure for steam of from 400 to 600 lbs. of coal per ton of rods, and the author believes that it is possible to still greatly reduce this. The four-inch billet is also much easier to handle, being only a quarter of the length for the same weight; it is thus more readily adaptable for automatic manipulation so that probably another 6d. to 1s. per ton could be saved here. There is little doubt that in the near future the production of a cheap four-inch billet will be an absolute necessity in this country.

It is probable, especially in America, that in no branch of rolling mill work has progress been so rapid and well sustained as in rod rolling during the last 10 years. This is the more remarkable when considered in connection with the fluctuations in other steel manufactures, and the financial and other crises passed through during this period.

Future Improvements in Rod Mills.

What improvements are in store for the future, and whether or not, or how far, the development of extrusion will supplant rolling, it would be idle to speculate on. One improvement, however, well within the range of modern practice, it might be as well to mention, not only as suitable for rod-rolling, but as applicable to all rolling mills, viz., the more extended use of roller bearings. Doubtless, in a mill having no less than 80 roll necks, the subject and possibility of saving is forced more on one than in a plate, sheet, or cogging mill having only four or eight roll necks; but even with these latter the saving may sometimes be very great, as the pressure when rolling is often enormous.

It is a very usual thing to suppose that the indicator diagram taken from a mill engine when mill is empty, but running at a uniform speed, represents the sum total power absorbed in friction when rolling. This is, however, far from being the case, as, according to the first law of friction, the same is proportional to the normal pressure, which, when rolling a wide plate, is no mean quantity; nor, likewise, in the aggregate on a rod mill having a multiplication of necks. The co-efficient of friction of cast iron on brass using unguents is about .05, whereas with a good roller bearing it may be only 1-10th to 1-20th as much. The value of a roller bearing in the saving of muscular exertion is perfectly obvious in a bicycle; why should it not be equally so when steam is used, and a journal also revolved? Besides the saving in the steam bill, there are other advantages which will be patent to all who have practical experience in rolling. With ordinary brasses, the unequal wear of the bottom ones throws the rolls out of level, and of the side ones out of plumb. These troubles, with their attendant consequences, would all disappear. There would not even be sinking of the rolls, as there is little or no wear in the hardened steel surfaces on which the rollers work, or in the rollers themselves. Roller bearings on cold rolling mills have run for three years without showing any perceptible wear, and in these the pressure is often excessive. The saving in lubricants over a year would also be no small item.

Inflated Values for Iron Properties.

Archer Brown, of Rogers, Brown & Co., New York, says in his market comment last week, referring to the boom basis for old iron-making properties: "An interesting feature of the situation in iron is the revolution in sentiment in financial circles with respect to iron and steel products, mines, furnaces, rolling mills and the like. A year ago these were looked upon, not only by investors, but also by banks and lenders of money, as hazardous. Now they are eagerly sought. The natural result is the flotation of schemes that must sooner or later bring disappointment to those who risk money in them. When a company can be organized with a share issue up in the tens of millions and its securities dealt in freely on the street at high and advancing prices on nothing apparently but names of Wall Street directors, and the prospect of acquiring in the future plants rejected by the early consolidations, and when a single furnace, of medium capacity and hitherto small earnings, can be capitalized at four times the cost to replace it, and the shares floated, it gives an occasional shiver of apprehension to the conservatively inclined. But history will repeat itself, and the investor will find too late that boom periods call for clear headed discrimination."

CHEMICAL ENGINES FOR FACTORIES.

A self-acting chemical fire engine, which is an adjunct of municipal fire service, but is employed also for fire protection in factories, warehouses, hotels, business blocks and other large structures, is manufactured by Obenchain & Boyer, of Logansport, Ind. The power to operate the engine is created instantaneously by the mixture of acid and alkali, which

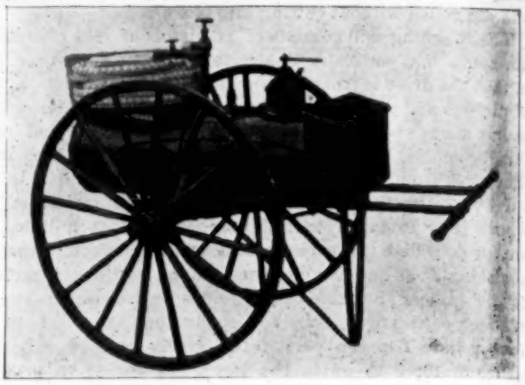


FIG. 1.

immediately generates carbonic acid gas. The illustration Fig. 1 shows a 42 gallon single tank engine of this type. Tanks are also furnished of 32 and 52 gallons capacity. The machines are built so that they can pass through any doorway 30 inches wide and are equipped with chemical box, 50 feet of hose and nozzle. They are easily operated and simple in construction.

The stationary chemical fire engine of the same makers is shown in Fig. 2 as erected in a building of several stories.

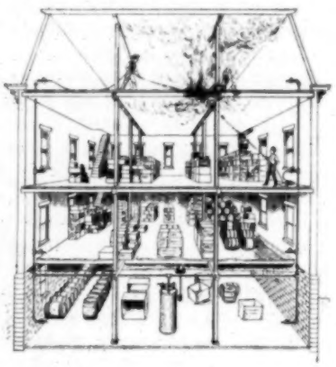


FIG. 2.

There are two hose connections on each floor, with facilities at each for putting the extinguisher in full operation. In five to eight seconds one, and if needed, two streams of carbonic acid gas may be directed upon a fire.

The Bettendorf Metal Wheel Co., of Springfield, O., will begin its heavy manufacturing season on Oct., 1, having since its shut down in July entered contracts with its manufacturing customers, its work being done under contract and advance specifications only. The company has also a large plant in Davenport, Ia., which covers Western territory as the Springfield plant covers Eastern territory including Canada and export shipments via New York. The Davenport plant has 40 per cent greater capacity than that at Springfield.

The George B. Sennett Co., Youngstown, O., is the successful bidder on a contract for the erection of three complete Uehling casting machines for the American Steel & Wire Co., one for the Allegheny plant and two for Cleveland. This, in addition to the orders already on its books, is sufficient to run the Sennett Co.'s plant nine months without further orders.

Review of the Technical Press.

BY DR. RICHARD MOLDENKE.

The Elasticity of Chilled and Ordinary Cast Iron. [*Zeitschrift des Vereins Deutscher Ingenieure,*] July 22.—Prof. C. Bach, the well known testing expert, made a series of tests on chilled cast iron recently which are intended to bring out information on its elasticity heretofore not available. The primary incentive to these experiments was the failure of a ball bearing the wearing surface of which had been chilled. It was desired to make some comparisons of the iron in its natural condition with the same material when chilled, so a number of test bars were cast from the same ladle and subjected to tensile and transverse test for elasticity. The tensile specimens had the form closely followed in the A. F. A series of tests on cast iron, and were in addition ground off square on the ends to admit of compression. The first series of tests was made upon four bars, two of which had been chilled, the mixture used being chill roll iron. The bars were loaded increasingly, the elongation and permanent set being measured in each case. A summary of the results gives the modulus of elasticity of the chilled iron as compared with that of the same iron in its natural state as much less variable and over one-third higher. The actual figures converted into our system are 11,932,500 down to 11,-039,500 for the chilled iron, and 8,610,750 down to 7,559,400 for the same iron in its natural state.

The next set of tests were made on four similar bars subjected to compressive forces. The first specimen was chilled on two sides only so that a thin layer of soft iron was observable in the interior. The modulus of elasticity in this case averaged 10,846,000. The second test piece, chilled on all four sides, ran 11,815,700, or somewhat higher, while the last two specimens, in which the iron was not chilled, had an average modulus of rupture of only 8,127,000. A comparison of the two methods would seem to show that the results are closely comparable. The third set of tests was made on six rectangular bars loaded transversely. The distance between supports was 36.36 inches, and the load began with the application of 330 lbs. at the center. From the elaborate table of results the following are taken: Two bars chilled on two sides, or nearly altogether white, averaged 11,281,000 for the modulus of elasticity. Two further bars, chilled on one side, tested chill side down, ran 10,158,700. Another two cast the same but tested chill side up, gave 9,675,000, showing the yielding nature of the soft iron at the bottom of the bar. The last two bars of this set were not chilled, and had an average modulus of elasticity of 8,707,500. A final trial was made with a tensile test bar turned out of a soft square transverse test specimen. This was loaded to get the modulus of elasticity and then tested to destruction. The drop in the first case to 7,759,400 shows the stiffening effect of the skin of a casting. The tensile strength of the particular iron was 27,-000 per square inch.

The Structure of Steel and Heat and Mechanical Treatment. [*Engineering News* Aug. 24]—Mr. Albert Sauveur, of Boston, in a paper read before the Iron and Steel Institute meeting, gives a concise and valuable summary of the relation between the structure of steel and its thermal and mechanical treatment. All steels, whether hardened or soft, except the burnt, when heated to a point at which the cement carbon passes into the hardening carbon state (about 1,200 to 1,375 deg. F.), assume the finest crystalline structure possible, even if very coarse through cold forging. If quenched suddenly it retains this structure, but becomes coarsely crystalline if cooled slowly down to the point of recalescence (about 1,150 to 1,300 degs. F.) The higher the original temperature to which a steel is heated, either for quenching or annealing, the larger the crystals, a slow cooling also increasing the size of the grain, hence the center of a forging is coarser than the outer portions. A piece of soft steel if heated below the changing point of the carbons is unaffected in structure whether quenched or slowly cooled. A piece of hardened steel, however, thus treated becomes softer the nearer the point of recalescence is reached. The effect of work is next taken up by Mr. Sauveur. At the outset the work done upon a forging having a temperature below the critical point is called cold, and when above it, hot. Heavy work does not allow the steel to crystallize, hence it often retards the formation of a crystalline structure until the completion of the forging process finds the piece cooler than it should be. The result is sometimes an undesirable structure due to cold working which produces a distortion of the crystals, flattening and elongating them. The following are the conclusions arrived at: Finished unhardened pieces should have as small a grain as possible, for this is the most ductile and tough. This means a heating up to the carbon changing point as a last treatment. This not being possible in all cases care should be taken to finish up very nearly at the point of recalescence. Since thick forgings will cool unevenly during working, and afterwards distortions producing forging strains are certain to take place, yet with the use of care and a pyrometer the foregoing principles are a good guide to the manufacturer in getting out the highest grade of work. The object of annealing is to soften the metal from a previous state of hardness due to quenching or cold working, to increase the ductility by removing the forging strains, and to obliterate the coarse crystallization caused by the quiet cooling from very high temperatures. Mr. Sauveur therefore recommends the heating up to 1,200 to 1,375 degs. F. of the piece to be annealed, then a drop to the point of recalescense (1,150 to 1,300 degs.), holding it there for some time and then cooling as desired. This leaves the steel in its softest condition. The figures given are for hard steel to soft steel, for the higher the carbon the lower the critical points. In hardening a piece of steel the critical temperatures should not be exceeded before quenching if good results are desired —this being in line with the regular advice of the steel maker to heat to the lowest point the steel will harden at. The balance of the paper is taken up with a discussion of the point whether a steel will crystallize more coarsely during the prolongation of the heating process above the critical point. Mr. Sauveur agrees with Prof. Tschernoff that it does not, while Prof. Howe and Messrs. Stead and Brinell claim the opposite. Prof. Howe writes a very interesting letter for the discussion, in which he calls attention to the danger of relying too entirely on the analogy of changes in the liquid body with those in solid ones. He quotes the example of heating a bar to a high temperature, quenching it suddenly and breaking it. According to Mr. Sauveur it should be finely crystalline, while it is actually coarse. Again if a nicked bar is thus treated, but before quenching one-half of the nicked surface is struck with a hammer, on breaking it that part is found fine grained and the rest coarse. The explanation in this case Prof. Howe holds to be that the high heat means a coarse crystallization, but the blow destroyed this and there was not time before quenching to get it coarse again. The discussion after the reading is given in *Engineering*, Aug. 18. Mr. Hadfield called attention to the omission of important details in the paper, for instance the specification of the quality of the steels spoken of, whether soft, medium or hard. Furthermore, he heartily endorsed the use of pyrometers in the manipulation of steel.

THE executive board of the Amalgamated Association met in Chicago, Wednesday of this week for the bi-monthly settlement with the American Tin Plate Co., relative to the average selling price of tin plate during July and August. It will be remembered that the scale this year is based on the selling price of tin plate. For every 10 cents that the average selling price of tin plate shipped in any two months exceeds the base price of $4.25, an advance of two per cent in wages is to be paid. As the company is still filling old contracts made before the last two advances, it is not considered probable that an advance will be found to be in order yet.

AT Elwood, Ind., the tin plate strike has been practically settled, the men returning to work, pending adjustment. W. H. Evans, the Amalgamated Association officer, whose discharge for violation of rules caused the strike, was not reinstated.

THE Dunbar (Pa.) Furnace Co. has advanced wages 5 cents a day, dating from Sept. 1—a total of 45 cents a day advance in eight months.

WAINFORD PIG IRON CASTING MACHINE.

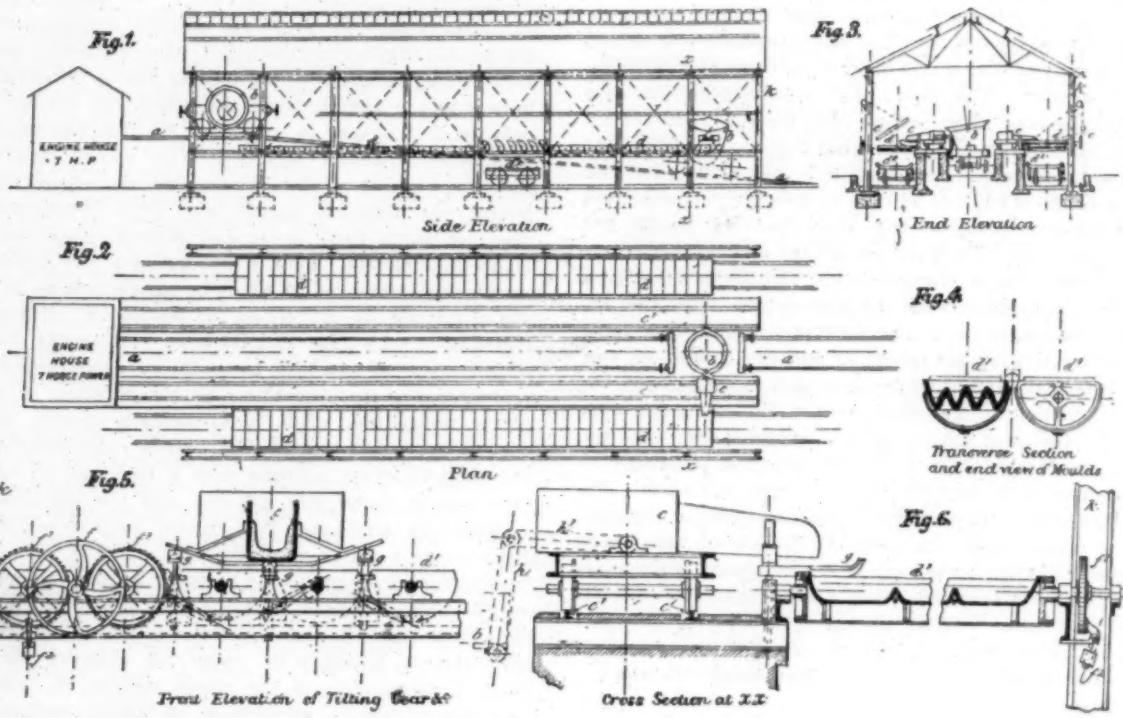
In our last issue we presented extracts from the paper read at the recent Manchester meeting of the Iron and Steel Institute by Richard H. Wainford, of Stoke-on-Trent, describing his pig iron casting machine. The accompanying illustrations will indicate its construction and method of operation, in connection with the following description:

The drawings show particulars of a machine capable of dealing with 60 tons of iron per hour. Briefly, b represents a 15-ton ladle; a, a central inclined ladle track; narow-gauge railways are placed on either side of the ladle track, upon which is traveled a controlling vessel, c, which is attached to the ladle by an arm. These narrow-gauge railways are placed horizontal, and at the outer side of them a line of 40 molds, d d, is also placed horizontally; and underneath each line of molds is run a wagon line, on which stands wagons d2, to receive the contents of the molds.

The full ladle is brought to the lower end of the inclined ladle track. The controlling vessel is then attached to it, and both are hauled by means of a wire rope, along the line of molds; at the same time the operator gradually tilts the ladle. The idea of the inclined plane is to avoid splashing of the molten metal, as by its use the lip of the ladle is kept low down and in a constant position with regard to the controlling vessel. After the metal has remained in the molds a short period, the molds are tilted over in pairs, as shown by the hand-gearing (see Fig. 5), and their contents delivered to the wagons d2.

The molds are constructed in a light, corrugated form (see Fig. 4), and are placed in semi-circular casings, leaving a cavity or space between the molds and the castings, in which is placed suitable non-conducting material. The corrugated form of the mold gives strength and lightness; and the question of lightness, combined with the non-conducting material, constitutes one of the chief points devised to avoid the chilling effect, and therefore preserves the texture in the iron. The molds are made detachable, and by releasing the bolts at each end of the casing may be readily taken out and replaced. The casings holding the molds are fitted at each end with trunnions, upon which they are revolved when required to be discharged. A locking gear is provided, as shown in Fig. 6, and the spaces between the molds close automatically during the operation of casting, as shown.

By these several means a continuous cast is obtained; the molds are held perfectly still while the metal is solidifying, thus avoiding mechanical action during that period, and by insulating the molds the chilling effect is also avoided.



IRON ORE DEPOSITS OF VENEZUELA.

From time to time statements have appeared in print concerning the iron ore resources of Venezuela. A few months ago the Supreme Court of Venezuela decided the suit of the Orinoco Iron Co. against the English Raleigh syndicate in favor of the former, settling the title to large holdings of iron ore property on the Orinoco River. The Orinoco Iron Co., of which John E. Searles of New York, is president, is a subcompany of the Orinoco Co., Ltd., which was formed in 1883 for the purpose of developing the resources of Venezuela. The decision referred to gave the Orinoco Iron Co. control of 14,000 acres of land rich in mineral deposits. A prospectus lately issued says that close to the Orinoco, and near the town of Santa Catalina, which is not far from the river's mouth is a hill of Bessemer ore containing 1,080,000,000, on a low basis of estimate.

It is now announced from New York that the Exploration Syndicate of that city has practically completed details for the absorption of the Orinoco Co., which is a $30,000,000 organization. The Exploration Syndicate, it is stated, will buy $16,000,000 worth of stock of the Orinoco Co., Ltd. Only a few cargoes of the iron ores of Venezuela have been brought to the United States. Chief Engineer David Lawson and his assistants, Messrs. Robinson and Lyle are now on the ground.

The first occurrence of the ore is on the Imataca Mountains, about 54 miles from the mouth of the Orinoco. The first mines were opened near the island of Corisimo, and large vessels are able to approach within 50 feet of the shore. At this point the ore is about 1,600 feet from the river and some 200 feet above it, appearing as bouders from 100 pounds to 100 tons in weight, and covering the tops of the hills for a distance of 3,000 feet in length and 100 feet in width. It has been estimated that there are between 150,000 and 200,000 tons of Bessemer ore in sight, and that the true vein has a thickness of 12 feet. Boulders of ore are found to the westward of this place for 35 miles.

SOMETHING like 20 patents have been granted in the past two years to E. A. Uehling, inventor of the Uehling pig iron casting apparatus. They embrace improvements upon the Uehling machine, most important of which are the spraying arrangement for coating the molds as they return on the underside of the apparatus, and a change in the shape of the mold lips, lapping one over another, to prevent the splash of metal and reduce scrap.

The American Car & Foundry Co. booked orders in August for about 6,000 cars.

BLOWER SYSTEM IN A LARGE SHOP.

The true type of the so-called gallery shop is represented in the accompanying illlustration as is also one of the most convenient methods for heating it. As one of the inherent features of such a construction is a crane travelling down the center the entire length of the building, it is impossible to carry pipes from one side to the other unless they are placed underground or run up overhead. Even the latter arrangement is frequently impracticable. The size of such a building, however, generally warrants the introduction of two sets in the manner shown, the apparatus and piping upon one side being an exact duplicate of that on the other. Each fan is provided with a double discharge, so that a portion of the air is discharged into the overhead system, whence it is forced toward the outer walls of the gallery, while the remainder of the air delivered by the fan passes into the duct beneath, from which the lower floor is similarly supplied.

This arrangement requires but little room for the apparatus, while the piping is so located as to be entirely out of the way, noticeably so in the case of the line running overhead in the gallery. The direction of discharge toward the outer walls is exactly what is desirable to secure its proper movement through the cooling action of the walls, and altogether the plant harmonizes in simplicity and symmetry with the building itself.

The plant of the Link Belt Machinery Co., Chicago, which is chosen for illustration, was built and installed by the B. F. Sturtevant Co., of Boston, from whose comprehensive treatise on "Ventilation and Heating" the preceding illustration and description are taken.

FIG. 1.

Utilization of Charcoal, Coke and Iron Wastes.

Some of the prominent utilizations of waste products which are well known to-day are in connection with the fuel supply. In the production of charcoal from wood there are large volumes of acetic vapors which, when condensed, are of considerable value. By charring the wood in ovens or retorts and conveying the vapors to condensers and stills, the products are charcoal, pyroligneous acid, tar, and uncondensable gases of considerable thermic value. These gases are used as fuel, the tar is merchantable, and from the pyroligneous acid methyl alcohol, acetic acid, and various commercial acetates are produced. The influence of locality is quite marked in this utilization, for at some iron works many thousand cords of wood are annually converted into charcoal, the pyroligneous acid as a by-product being made into acetates and wood-alcohol. At other works the wood is charred to secure the pyroligneous acid, the charcoal being a by-product, but most of the wood cut for charcoal is charred and no effort is made to collect the acetic vapors.

The same principle holds in regard to the manufacture of coke. As a rule, the products of distillation from the coal while being coked pass off into the air as dense smoke and are wasted, but at a number of localities the volatile matters are condensed and commercial ammoniates, tar, and gases of calorific value are utilized. It is claimed that, in addition to the commerial by-products from coking 10 tons of average bituminous coal, incondensable gases, equivalent in calorific value to one ton of coal, result.

In the iron industry there are numerous applications in utilizing waste or refuse, including the production of cement, mineral wool, paving blocks or monolithic paving, from blast furnace cinder; the remelting or converting of unmerchantable masses of metal, ladle-sculls, crop-ends, shearings, punchings, filings, etc.; the re-rolling of rails; the utilization of blast furnace gas to heat air, produce steam, etc.; the restoring of the exterior heat of an ingot by means of a soaking pit, and the sinking of scrap in forges and furnaces; the almost universal generation of steam by waste heat, and many others. —[John Birkinbine in Cassier's Magazine for September.

Republic Iron & Steel Co.

It is announced that the Republic Iron & Steel Co. will begin at once the erection of a Bessemer steel plant at Youngstown, O., with a capacity of 600 to 800 tons a day. It will be connected with the Brown-Bonnell plant of the company. It is reported that portions of the steel plant at Alexandia, Ind., belonging to the Republic Iron & Steel Co. will be removed to Youngstown and incorporated in the new works.

Plans have been made for the erection of a third furnace at the Pioneer plant of the Republic Iron & Steel Co. at Thomas, Ala. The stack will be 18x80 feet and the capacity upward of 200 tons a day. The company has recently placed orders for six blowing engines.

Shenango Valley Open-Hearth Steel Plant.

Application will be made Oct. 2 for the incorporation of the Sharon Steel Co., the directors named being F. H. Buhl, David Adams, Nevin McConnell, James P. Whitla, all of Sharon, and George Darr, of Pittsburg. The capital stock will be $3,000,000. A tract of 400 acres of land has been donated, between Sharon and Wheatland. The calculations of the promoters include two blast furnaces of 600 tons capacity each, and a steel mill containing 12 basic open-hearth steel furnaces having a capacity of about 1,000 tons of ingots a day. The plans are now being prepared and it is expected the plant will be completed within two years. A finishing Mill is likely to be connected with the steel mill. F. H. Buhl who is prominent in the new enterprise, was president of the Buhl Stee Co., whose plant was sold to the National Steel Co., also president of the Sharon Iron Co., whose furnaces and coke works were taken by the National Steel Co., and its rolling mills by the Republic Iron & Steel Co.

E. A. SCHUMACHER and F. W. Boye, Jr., of Cincinnati, announce that on Sept. 1 they formed a partnership under the name of Schumacher & Boye and acquired the machine tool business of the firm of Dietz, Schumacher & Boye, which was dissolved on that day by mutual consent, Jacob Dietz having retired from the firm.

PATENT GROOVER OR DADO HEAD.

Huther Bros., of 229 and 231 Mill st., Rochester, N. Y., are manufacturers of a patent groover, of which an illustration is given below, together with a sample of the work done. It is designed to cut a groove of any width, from ⅛-inch to 2 inches or over. There are two outside saws, ⅛-inch thick,

FIG. 1.—HUTHER DADO HEAD.

each of which is a groover in itself, and in addition as many inside cutters as required. The inside cutters are made 1-16, ⅛ and ¼-inch thick so that any width groove measurable in sixteenths may be cut. The operation of the groover gives a perfect groove, either with or across the grain, no rough edge

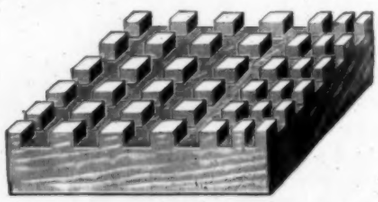


FIG. 2.—SHOWING GROOVE WITH OR ACROSS GRAIN.

being left. The outside cutters may be used singly, together or in connection with as many or as few inside cutters as may be needed. The groover may be used on any circular saw mandrel.

Carnegie Steel Co. as Vessel Owner.

Commenting on a matter that has been discussed not a little in lake marine and iron circles this season, "The Man on the Dock" says in the current issue of the *Marine Review:*

"Unless I miss my guess very badly, these high freights will drive the Carnegie Steel Co. into the vessel business before long, and on a very large scale when they do begin operations on that score. It was just such a year as this that caused John D. Rockefeller to play 'button' with the ship builders when he let his first contract for 10 ore carriers. While it is true that the Rockefeller-Carnegie contract binds the Carnegie company, or rather the Oliver Mining Co., which is practically the same interest, to furnish for transportation to the Rockefeller ships a large amount of ore, it is well understood, of course, that this does not mean all the Lake Superior ore—more than 4,000,000 tons annually—now controlled by the Carnegie Co. The Carnegie ore on which Bessemer Steamship Co. (Rockefeller ships) has the call, is in fact probably not more than half of the total output of Carnegie mines. With this point in view, it will readily be seen that while the other big steel manufacturing combines, like the Federal, National and American Steel & Wire, have been fortifying themselves by the purchase of ships as well as mines, the Carnegie company has, aside from its contract with Rockefeller for the transportation of a part of its ore, only a few small steel vessels, secured recently through the purchase of the Lake Superior Iron Co., and is therefore dependent upon individual vessel owners, now growing fewer in number from day to day, for the movement of a very large part of its ore. The Carnegie company is in fact dependent upon the small fleet of ships now owned by individual vessel owners to a greater extent than any of the other big steel companies. Is it not reasonable, then, to expect from this company, which has a very difficult problem to meet for next year, a move towards the ownership of vessels? Ships of the kind they would want can neither be bought nor built for next year, and it is a question whether they could, if they desired it, secure the construction of an adequate fleet in lake yards for the spring of 1901, unless they should make immediate arrangements to furnish the material themselves. But they could, if they thought it good policy to do so, readily equip a ship yard on their own account, and provide machinery so as to get out a few vessels late next year. It is a wonder that they have not entered into an undertaking of this kind, in view of the large sums that will be involved in their expenditures on account of lake freight next season. How nicely they would have had this matter in hand if they had purchased the Wheeler ship yard at West Bay City, when it could have been secured at a low figure before it was taken over by the lake ship yard consolidation."

INCREASED COST OF MAKING TIN PLATE.

But for the fortuitous boom in the Welsh tin plate trade, by which the price of tin plates in Wales has been very much advanced, the American Tin Plate Co. would now be in a very awkward position indeed. Last November imported tin plates were offered in New York, duty paid, at $4 a box, and this figure is far below the present actual cost of manufacture in the United States, allowing nothing whatever for dividends and other fixed charges. If this price for Welsh plates had not been advanced, the tin plate trust would have had to face, in the first year of its existence, the alternative of surrendering the trade and making no money, or keeping it and piling up a large deficit. But with the advance in Welsh tin plate, the company has been able to advance its price $2 a box above the price at which the individual companies were selling last fall, and still keep it 60 cents below the price of imported plates. During this period, however, the cost of steel, pig tin and labor alone has advanced $1.94 a box, and there are a great many smaller items of cost in tinplate making whichhave increased as well.

When the tin plate manufacturers decided last November to go into the trust it was stated that they did so because some of them were actually losing money, while the best were making very little. Tin plate was then selling at $2.65 for 100-lb. coke plates at mill, steel billets were $15 a ton at mill, and pig tin was 18 cents a pound in New York. The price of tin plate is now $4.65 a box, steel billets are $40 a ton, and pig tin has averaged in the past few weeks about 32 cents a pound. Allowing for waste in rolling, a ton of steel will make about 18 boxes of tin plate, so that the advance of $25 a ton in steel amounts to $1.38 per box of tin plate. It takes two and a half pounds of tin to make a box of tin plate, allowing for waste, so that the advance of 14 cents a pound in tin means 35 cents per box of tin plate. The advances in labor, including the tonnage and day men, amount to 20 cents a box since last November. This makes a total of $1.94 per box of tin plate in these three items alone. Besides this, fuel, castings, acid, palm oil, flux, empty boxes, and the many other supplies for tin plate making have all advanced more or less, and freights on these and on steel and pig tin have advanced as well.

There is no doubt that the trust is introducing a great many economies in manufacture, by centralized management and comparisons of costs at different plants, and will be able to buy its raw materials cheaper than could an individual producer, but at the same time it must be borne in mind that such changes are not accomplished in a short period. Barring such advantages, it is evident that the cost of making tin plate has advanced considerably more than the $2 a box by which the trust has advanced the price. Before the last advance of the trust, its price was considerably more than 60 cents below the price of imported plates. But while the trust has made an advance in price of 27½ cents a box, the price of Welsh tin plates has dropped about 9d. a box, and these two items together reduce the differential to only about 60 cents.—[Tin and Terne.

While the cost of the constituent materials which go into the manufacture of tin plates has risen more than the 100 per cent, the price of the finished plates has been marked up only 62 per cent. It would certainly appear that the advance in the price of tin plates under the American Tin Plate Co.'s regime is not only not excessive but that it has been surprisingly moderate. As a matter of fact tin plates are relatively cheaper at the present time than almost any other article of iron or steel manufacture.—[The Metal Worker, Aug. 19.

THE FOUNDRYMEN'S ASSOCIATION.

Philadelphia, Sept. 6.—With skilled molders at a premium in this vicinity the problem of securing an efficient force of trained workmen naturally was given considerable attention at the first fall meeting of the Foundrymen's Association, held at the Manufacturers' Club to-night. The executive committee's report formally called attention to the scarcity of good molders, core and pattern makers and advised a consideration of the labor conditions. Advances in the prices of pig and scrap iron and the sundries requisite in the manufacture of castings were noted and a proportionate advance in the price of the castings advocated. The report as submitted by Secretary Evans is as follows:

"This is our first meeting since the summer recess. A number of changes have taken place that are of interest to the foundry trade. The first is the rise in pig iron and scrap of from $3 to $4 per ton. This in itself must have the effect of advancing the price of castings to at least a like amount. In addition there has been an advance in the price of several other articles that has affected the foundry trade. For instance, plumbago, which is used to make foundry facing and blacking; steel wire, for making cleaning-brushes; bristles, for making dust brushes and scrubs; steel, for making shovels; riddles, tools and other articles; also coke and coal for fuel. Almost every article used in the making of castings has advanced. We call the attention of all foundry men to these matters that they may see how important it is to advance the price of their product in proportion. Second, there seems to be a scarcity of good molders, core makers, and pattern makers, which should also be taken into consideration. We find that through the instrumentality of some of the local foundrymen's associations in different parts of the country, they have actually made out a card price at which their castings should be sold. We find that Pittsburg and Milwaukee have taken advantage of the plan. There seems to be no trouble to maintain these prices. In fact, there is more work offering than there are foundries to do it. If you will stop to consider these facts, we think you will decide with us that the foundry business in iron, steel and brass is in a very prosperous condition. We find further that nearly all of our foundries in and about Philadelphia have all they can do and a little more, to keep pace with their orders. While it is not the intention of this association to make a card price for either castings or labor we trust this may have the effect of encouraging the foundrymen to get their just dues."

In the discussion which followed the report it developed that there had been an advance in castings in all quarters in the past few months of from ½ to 1½ cents per pound, with prospects of further advance.

Returning to a consideration of the labor situation, J. C. Williams, of the Enterprise Mfg. Co., explained that the scarcity of good men had induced many workmen with less than six months apprenticeship to pose as journeymen and demand the latter's wages. Among the various plans suggested for the correction of this evil was one from S. P. Cook, a representative from the United States foundries at Washington, which impressed the membership as being the correct way to deal with the situation. Mr. Cook advised the firms to train their own workmen.

"Take the apprentice," he said, "and work him through the various departments. After he has completed his course give him a letter to that effect and he will then be enabled to secure a position anywhere. We will feel sure in hiring that man that we are hiring a good one and in this manner the foundrymen will be enabled to overcome the burden of organized labor." The cleanliness of the foundry was also touched on by Mr. Cook. He argued that the establishing of up-to-date wash rooms in all foundries would eventually tend to make the average molder as tidy as a bank clerk.

As heretofore, the still advancing price of iron was freely commented on and the general opinion appeared to be that the price would continue on its upward course. President Wanner expressed the opinion that no such slump was to be expected as occurred in 1880, when the price dropped from $42 to $25 per ton in a few days. One reason for this belief was the fact that furnaces formerly held by individuals and small corporations are now controlled by syndicates who can withstand any attempts to drop prices. As a further assurance he cited the fact that in many instances furnaces are sold up to July, 1900, and a few even to December, 1900.

There is no apparent disposition on the part of the association to go in for the "card price" system which is operating to some extent in the West. Schwab & Sercomb, of Milwaukee, in a letter which was read by Secretary Evans strongly urged the making of "card prices" for castings and labor. The Milwaukee firm which has been working in conjunction with others on this system for the past year, advocated it as a good method for avoiding the hardship of ill-timed demands of organized labor, and at any rate giving the foundrymen his due.

Though the price of iron has advanced nearly $5 per ton since the last meeting of the association, no new scale of prices for castings was suggested. The subject came in for a short discussion, the result of this being that it was deemed advisable to allow the demand to regulate the price. At present, hereabouts, the supply is about equal to the demand and under such circumstances the market could not well be advanced by agreement.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The charter of the Fort Worth Iron Works, of Fort Worth, Tex., has been filed. The capital stock is $50,000.

It is reported that the Norfolk & Western Railroad machine shops at Shenandoah City, Va., will be removed to Roanoke, Va., in a few weeks.

At York, Pa., John G. Rau, Charles Morton and Daniel Ness have bought of C. H. Frey a 16-acre tract of land. They will build a large plant, which will turn out agricultural machinery.

"Furnace," care of *The Iron Trade Review*, is in the market for new or second-hand Crane or Otis hoisting engine for blast furnace use. A 9x14 or 10x16 cylinder engine desired.

The McCullough Iron Co., North East, Pa., contemplates operating its plant by steam instead of water power.

The United States Mfg. Co., of Fond du Lac, Wis., will locate at Oshkosh, Wis., a plant for the manufacture of bicycle supplies and novelties and an improved gas engine.

The American Ship Building Co. announces plans for the improvement of the Wyandotte yard of the Detroit Ship Building Co. The plans include the building of the dry dock, which will be 550 feet long. There will be installed a Brown cantilever crane, a compressor plant, pneumatic tools and all modern equipment.

J. B. Poore, Scranton, Pa., wants new or second-hand boring machine, 4⅛ inch or 5-inch bar.

The Little Giant Co., Dallas, Tex., has been incorporated, with a capital stock of $410,000, for the purpose of manufacturing cold storage machines, by E. S. Edwards, Frederick L. Kenny and W. L. Hall.

The National Tube Co. proposes to put in six pumping engines at its plant at Benwood, W. Va.

Henry W. Perry, Tunstall B. Perry and Robert D. Smith have incorporated the Trussville (Ala.) Furnace, Mining & Mfg. Co., with a capital stock of $250,000, to conduct a general mining and manufacturing business. The company will operate the blast furnace at Trussville, and is preparing it for blast. Principal office, Birmingham.

New Construction:—

The plans for the new machine shop of the Pennsylvania Steel Co. are almost completed. It will be a building 500x160 feet and will be located between Nos. 1 and 2 blast furnaces and the old gas producer. The present machine shop will be used by the bridge and construction department. The latest and most improved machinery will be introduced into the new shop.

A Birmingham, Ala., dispatch says that a cast iron pipe works plant will be located in the Birmingham district in the near future by James Bowron, vice-president and treasurer of the Tennessee Coal, Iron & Railroad Co.; J. R. P. Dimmick and others. Mr. Dimmick, who was former manager

of the United States Car Co 's works, at Anniston, will be general manager. At a meeting in Birmingham $175,000 worth of stock was subscribed for, principally by gentlement interested in the Tennessee Coal, Iron & Railroad Co. The plant will be located either at North Birmingham, East Birmingham or Ensley City.

At Northville, Mich., the burned portions of the American Bell foundry are nearly rebuilt. A machine shop will be added.

The Oriskany Malleable Iron Works, Rome, N. Y., have let contracts for additions to their plant. For many months they have been obliged to work a part of their hands nights in order to keep up with orders.

At Reading, Pa., the Reading Iron Co. has begun a new iron building 120x160 feet, also another mill 40x68 feet. Plans are completed for new car shops at Reading, 86x402 feet for the Reading Railroad.

The Bettendorf Metal Wheel Co., of Springfield, O., has just completed a foundry building of modern construction covering a floor space of about 15,000 square feet, and is finishing an additional warehouse building covering over 16,000 feet of floor space. With these additions and the improvements now under way in its present plant the company will be prepared to manufacture 75 tons of finished wheels per day. The new buildings are all of brick, steel and slate.

The Henri Nestle Co. is establishing a large plant at Fulton, N Y., for the production of its specialities in the United States. This firm has its headquarters in Vevay, Switzerland, and before establishing its plant in this country, had constructed a similar one in Sweden The plant at Fulton, N. Y., will be fireproof, and of modern construction, using steel framework for the floors and roofs, with brick side walls, the floors being constructed of concrete supported by steel beams. The Berlin Iron Bridge Co., of East Berlin, Conn., furnished and erected all the steel structural work under the supervision of H. J. White, consulting engineer or Henri Nestle.

The Ohio Steel Mfg. Co., of Canton, O., incorporated with $125,000 capital, will manufacture high grade tool steel as well as all classes of steel castings. For several years the Eagle Crucible Steel Co., which is merged in the new company, has been manufacturing high grade lathe tool steel. A building 80x200 feet will be erected, and the latest equipment and open-hearth furnace will be provided. A site containing six acres is to be secured and a committee of the board of trade is soliciting subscriptions. The plant is to be built adjoining that of the Canton Rolling Mill Co.

The addition to the machine shop of the Webster, Camp & Lane Machine Co.'s plant at Akron, O., will be 66x80 feet. It is expected to complete it in 60 days. An additional pattern house will also be erected.

The Wellman-Seaver Engineering Co., of Cleveland, has closed a contract with F. B. Nichols to do the engineering and superintend the building of a pipe foundry to be located near Birmingham, Ala. The plant will embody all the latest ideas in successful foundry practice. Capacity will be 150 tons per day. It wil be the most modern type fire proof construction throughout, with a complete electrical installation for driving all the cranes and the various machines.

An addition 64x100 feet will be built by the Lorain Foundry Co., of Lorain, O. The work will be pushed to completion. At present 220 men are employed and the company is full of orders.

At Lake Charles, La., work has begun on a two story machine shop, foundry and boiler works building, 110x40 feet, for the Calcasieu Iron Works. Other buildings will be erected as needed.

The Roane Iron Co., Chattanooga, Tenn., has announced that it will begin at once upon the erection of an additional furnace at Rockwood, Tenn.

At Louisville, Ky., the National Foundry & Machine Co. will rebuild its plant, burned last week.

At Philadelphia it is reported that the Link Belt Engineering Co. will erect a brick and iron annex building, 60x100 feet, to be used as a machine shop.

Reports state that the Pottstown Iron Co., Pottstown, Pa., proposes to raise $1,000,000 to construct a large open-hearth addition to its local basic Bessemer steel plant, for making repairs necessary to operate its large furnace there and to provide working capital. The furnace has been idle since 1895, and the steel plant since 1893.

FAeirs andccidents :—

The Shelby Steel Tube Co.'s plant at Shelby, O., was party destroyed by fire, which started in the rolling department on Sept. 8. The loss is $40,000, insured.

At Louisville, Ky., Sept. 8, fire destroyed the stove foundry of Bridgeford & Co., causing a loss of $200,000; insurance about $100,000.

The Pittsburg District :—

Somers, Fitler & Clarke, Ltd., of Pittsburg, have been awarded the contract for installing hot air heating system in the new shops of Messrs. Heyl & Patterson, at Pittsburg. They also are furnishing the machine tools, some of which will be among the largest of their kind in Pittsburg.

The Westinghouse Machine Co., at East Pittsburg, is working on a gas engine which is expected to develop about 1,600 h. p. It is the intention to drive this engine with blast furnace gas.

Experts have been giving testimony before the coroner in the matter of the boiler explosion at the Republic Iron Works, South Side, last week. Francis B. Allen, of Hartford, Conn., vice-president of the Hartford Steam Boiler Inspection & Insurance Co., gave the opinion that the explosion was due to low water. He found that the boiler was amply strong for all work required, with a large factor of safety.

W. L. Lindsley, Pittsburg manager of Pawling & Harnischfeger, of Milwaukee, has closed a contract with J. S. Coxey, of Massillon, O., for four electric traveling cranes for the Coxey steel casting plant to be erected at Massillon.

The National Tube Co. has recently adopted a rule to make out foreign bills according to the British currency system, and a number of clerks at McKeesport are finding the system considerably more difficult than the American.

The Sterling White Lead Co., Pittsburg, has increased its capital stock from $200,000 to $500,000, and will erect an additional corroding house at the plant at New Kensington, to contain 34 corroding beds, equipped with 3-ton electric traveling cranes.

Work has been commenced on the 14-inch bar mill to replace the one injured by the explosion Saturday week at the Republic Iron Works, South Side, Pittsburg, of the National Tube Co. The building will have to be rebuilt and all the machinery overhauled. The 16-inch mill, adjoining, which was slightly affected, is in operation again. The cost of making good the damage will be about $10,000.

The A. Garrison Foundry Co., Pittsburg, has notified its employes of an advance in wages averaging about 10 per cent.

W. J. Carlin, Pittsburg, has purchased the buildings belonging to the old Graff-Bennett mill at Millvale, Pa. There are four of them, and they have an interesting history, having formed part of the Centennial Exposition buildings, in Philadelphia in 1876. The material is all iron, and has already been sold.

The propery of the Spang Steel & Iron Co., at Etna, Pa., was sold at auction Saturday, Sept. 9, to George A. Chalfant for $130,000. The land embraces a trifle over 10 acres and is that on which the Spang Steel & Iron Co.'s plant was located. The company ceased operating some time ago, and the affairs are being wound up. The old buildings on the property were sold recently to Jacob S. Coxey, who is removing them to Massillon to be used in the erection of a steel casting plant. The purchaser is manager of Spang, Chalfant & Co. but it is not known for what purpose the property was bought. The price paid is considered high.

The Amalgamated Association officials have refused to countenance any disturbance in the Indiana tin plate mills, where there has been trouble over the suspension of W. H. Evans, vice-president of the Fifth District, for bringing beer into the mill. The men had desired to go out on strike on the pretext that Evan's dismissal was due to other causes, although they admitted at the same time the charge against him was true and sufficient for dismisssal.

Chicago District and Northwest :—

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000, has been incorporated by Allan R. Bancroft, H. T. Barrett, and S. Leonard Boyce.

Work has begun on the first of the additions to the plant of Milwaukee Harvester Co. A building permit was issued last week for a foundry to cost $60,000.

The Illinois Steel Co. has begun work on the first of four new buildings for its plant at South Chicago, to cost $75,000. They are to be located east of the Strand, and 250 feet north of the Calumet River. They are described: Boiler house, 64x41x45 feet; crusher building, 147x64x46 feet; rope drive house, 147x26x20 feet; burner building, 98x68x48 feet.

H. P. Spaulding, Pabst Bldg., Milwaukee, has recently installed a Cookson feed water heater with the Diamond Soda Works, and is now installing a 200-h. p. Cookson feed water heater and receiver in the Court House and one of the same size in the foundry of Wm. Bayley & Sons Co., all of Milwaukee. He is also equipping the North Western Malleable Iron Works and the Western Leather Co. with the Northwestern automatic smoke preventer, a device that does away with smoke and saves fuel, by giving perfect combustion.

The H. W. Caldwell & Son Co., of Chicago, expect to have their new plant at 17th st. and Western ave. in operation by the first of the year. They will have a machine shop about 100x180 feet, and will add later on a perforating and wood working plant. The plant is situated on the Belt Line of Chicago, Northwestern and Pan Handle tracks, giving exceptional shipping facilities.

The Excelsior Foundry Co., Belleville, Ill., which has added a jobbing malleable iron department, is making prompt shipments of gray and also malleable iron castings.

The annual meeting of the Chicago Drop Forge & Foundry Co. will be held at the office of the company, Kensington Ill., Sept. 15, at noon.

The American Steel & Wire Co. has acquired another Chicago wire factory. Papers have passed transferring the Garden City Wire & Spring Co. for $20,000. The company taken has a factory at Chester st. and Clybourn ave., and makes a speciality of wire springs.

It is reported that the Wisconsin Central Railway Co. will remove its shops from Stevens Point, Wis., to Fond du Lac, Wis. The latter city has offerd a bonus of $15,000 and a site for the plant.

The H. S. Eldred Co., Stiles, Wis., which is building a new pulp mill at that place, is in the market for machine work and machinery in general for the plant.

The Enterprise Foundry Co., Muskegon, Mich., will build an addition 36x50 feet and a new pattern shed 30x30 feet.

It is reported that the shops of the Ann Arbor Railroad will be removed to Alma, Mich.

C. P. Parish & Co., Chicago Heights, Ill., have awarded a contract for the erection of an addition to their plant, comprising a two story and basement building, covering 50x175 feet.

The Green Engineering Co., Chicago, which recently secured a contract for 20 grates for the West Chicago Street Railway Co., announces also a contract for 16 grates which are to go into the new power house of the United Railways Co., of St. Louis.

General Industrial Notes:—

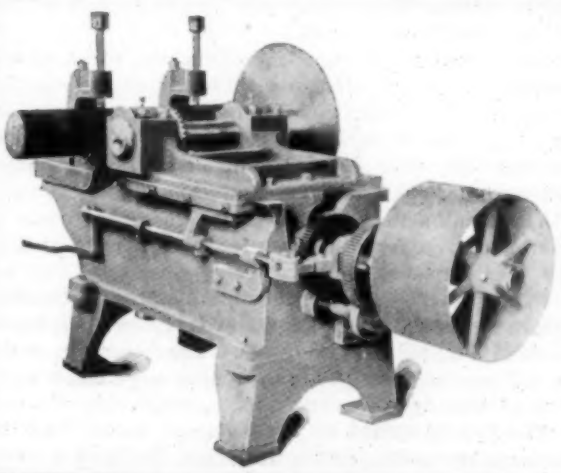
The Enterprise Boiler Co., Youngstown, O., has completed its shipments of material for extensive repairs on the Duluth, Minn., furnace.

The C. W. Hunt Co., New York, is reported about to ship to Copenhagen an $80,000 outfit of coal-handling machinery, including steam shovels, engines, conveyors and automatic railways.

The plant of the E. A. Henry Wire Co., Cuyahoga Falls, O., is equipped to turn out 25 tons a day of wire and wire nails.

A new Wheeler boiler has been completed at the Hannah Furnace of the Republic Iron & Steel Co., Youngstown, O.

The Bessemer (Ala.) Rolling Mill Co. will be reorganized



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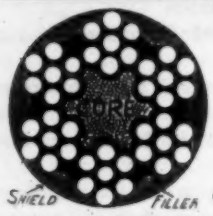

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BUHL MALLEABLE CO., Detroit, Mich.

and resume operations. AddressMorrisAdler,Birmingham,Ala.

The Chisholm & Moore Mfg. Co., Cleveland, manufacturer of chain hoists and of cranes, has lately established a department for the manufacture of malleable cast iron.

Hall Furnace, at Sharon, Pa., of the Republic Iron & Steel Co., was banked Saturday last, the men going on strike for a by-weekly instead of a semi-monthly payday. The actual rate of wages does not enter into the controversy. New men will probably be put at work this week.

The two blast furnaces near Marietta, Pa., owned by C. Ross Grubb and Horace L. Halderman, have been sold to C. R Baird & Co., of Philadelphia. With the furnaces go rights to ore from the Cornwall mines The capacity of furnaces is an annual output of 33,500 gross tons. Mr. Baird has also purchased the West End Furnace, at Roanoke, Va., and is preparing to put it in blast.

C. Taylor and A. B. Taylor, have leased from the Empire Steel & Iron Co. the rolling mill in connectinon with the old Valentine furnace plant, at Bellefonte, Pa. Work has been begun making the necessary repairs and the mill will be put in operation in a few weeks.

The Riter-Conley Mfg. Co. of Pittsburg, which recently received the contract to build four blast furnaces at Sydney, Cape Breton, for the Dominion Iron & Steel Co., at a cost of $2,500,000, has taken also the contract for 10 50-ton ope-hearth furnaces, blooming mill and complete steel plant equipment. The contract will be completed in 1901.

The manufacture of gasoline engines has begun at the Marinette Iron Works, Marinette, Wis. The working force has been increased.

In August the Bessemer converting mills of the Youngstown works of the National Steel Co., Youngstown, O., made 4,385 heats and 44,897 tons of ingots. The blooming mill made 39,656 tons, consisting of 12,255 tons of large billets and 27,401 tons of small billets and tin bars.

The Wm. B. Pollock Co , Youngstown, O., has been awarded the contract for the boilers and stacks for the new steel plant about to be erected by the Republic Iron & Steel Co., at the

U. BAIRD MACHINERY CO.,

423-425 Water St., **PITTSBURG, PA.,** 124-126 First Ave.

Machine Tools and Supplies. Send for list of Second-hand Tools.

THE BEST AND THE CHEAPEST.

BRIER HILL PORTLAND CEMENT.

The Brier Hill Iron & Coal Co.,
YOUNGSTOWN, O.

KENTUCKY FIRE BRICK WORKS.

CUPOLA BRICK. STEEL WORKS BRICK.

KENTUCKY FIRE BRICK WORKS, PORTSMOUTH, O. HIGH GRADE FIRE BRICK BEST BLAST FURNACE & ROLLING MILL BRICK

FIREBRICK, KY.

"It is true that advertising will not put merit into poor merchandise, but good merchandise often becomes poor for the want of good advertising."

—*Some Essential Oils for Advertisers*

Ore and Coal Handling Machinery

For Blast Furnaces, Docks and Mines.

MINING MACHINERY,
HIGH GRADE HOISTING ENGINES.

WEBSTER, CAMP & LANE MACHINE CO., Akron, Ohio.

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BANKERS AND BROKERS,

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offer unsurpassed facilities for transactions in the iron and steel stocks, either listed or unlisted.

Private wire connections with New York, Chicago, Boston, St. Louis and Philadelphia.

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Regenerative Gas Furnaces and Water Seal Gas Producers.

Producer Gas under Tubular Boilers, saving 20 per cent in fuel. NO SMOKE.

FIRE BRICK.

BRANDS:
O. K. CROWN.
O. K.
A.

SUITABLE FOR
Furnace, Malleable, Mill, Foundry and Lime Kiln Work.

OAK HILL FIRE BRICK AND COAL CO.,
OAK HILL, OHIO.

Advertisements that are studied, that are to the point and that are frequently changed, bring best results.

PHOENIX HORSE SHOES—ARE THE BEST HORSE SHOES MADE

CATALOGUE SENT ON REQUEST.

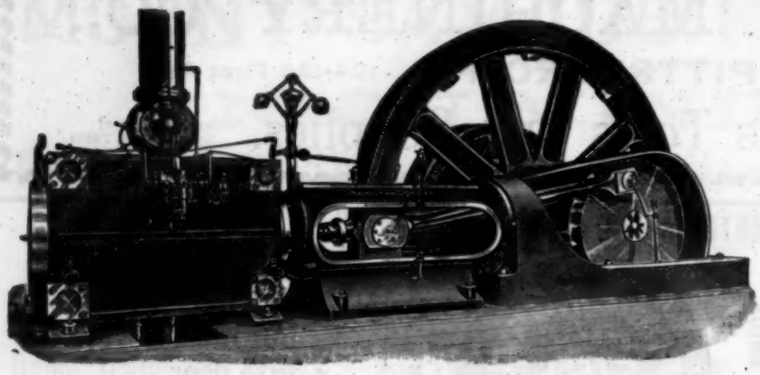
PHOENIX HORSE SHOE CO., POUGHKEEPSIE, N. Y.—JOLIET, ILL.

Brown-Bonnell plant, Youngstown, and also for the new National Steel Co., blast furnace to be erected in New Castle. The Enterprise Boiler Co. was awarded the contract for the boilers for additional plant at Martin's Ferry, O.

The Muirkirk Furnace, at Muirkirk, Md., will not go in blast until October, owing to difficulty in getting fire bricks and ore.

Bells' Steam Engine Works, Buffalo, N. Y., report that they have been running their plant to its utmost for the past eight months on steam hammer work, and have been making shipments on the average every week. Among orders for hammers they mention a No. 1 for the City of New York municipal works; a No. 1 for Cienfuegos, Cuba; a No. 1 for Nanticoke parties, the second of the same size sold the firm; a No. 1 for Trenton, N. J.; a No. 1 for Boston, Mass.; a No. 2 to Dunbar & Sullivan, for their Rockland, Me., works, the fifth hammer sold the firm; a No. 2 for Amapola, Honduras; a No. 2 for the U. S. Engineer's office, San Juan, Puerto Rico; a No. 2 to Seattle, Wash.; and a number of No. 3, among them hammers to the Stirling Co., Barberton, O.; Willard, Sons & Bell Co., Chicago; American Ship Windlass Co., Providence, R. I. They shipped last week a No. 1 for the Brooklyn Navy Yard, and are now working on a No. 3 for Chicago parties, a No. 2 for St. Louis, a No. 2 for Montreal, Que., a No. 2 for New York, a No. 3 for railroad customers in Missouri, sold by dealers, who also entered an order for another No. 2 steam hammer, and a No. 1 for the Chicago parties, for shipment to their Boston store. The outlook for trade in all branches of the iron and steel business, judging from the inquiries the company is constantly receiving is the best they have seen for some time, and they see no reason why it should not continue as bright as it is to-day.

THE HOOVEN, OWENS & RENTSCHLER CO., Hamilton, O.



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Engines for Rolling Mills Electric Railways and Electric Light.

Engines of all Sizes and for all purposes.

46 South Canal St., CHICAGO.
39 and 41 Cortlandt St., NEW YORK.
Lewis Block, PITTSBURGH, PA.
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C. C. MOORE & CO., SAN FRANCISCO, CAL.

Locations for Industries.

The Chicago, Milwaukee and St. Paul Railway Company has all its territory districted in relation to resources, adaptability and advantages for manufacturing, and seeks to secure manufacturing plants and industries where the command of raw material, markets and surroundings will ensure their permanent success.

A number of new factories and industries have been induced to locate—largely through the instrumentality of this company—at points along its lines.

The trend of manufacturing is Westward. Confidential inquiries are treated as such. The information furnished a particular industry is reliable.

Address

LUIS JACKSON,
Industrial Commissioner, C. M. & St. P. R'y.
Old Colony Building, Chicago, Ill.

...A B C OF IRON...

A book for foundrymen. It is issued in cloth binding, and gives much valuable matter on how to reduce cost of mixtures, and on grading and numbering of pig iron.

CHAPTER HEADINGS:—Iron—What is it? Pig Iron. Constituents of Iron. Numbering of Pig Iron. Grading of Iron. How to reduce cost of mixture. Steel. Physical Properties of Metals Defined, Statistics. Early History and Manufacture of Iron.

Former Price, $2.00. NOW $1.00.

Sent, postpaid, on receipt of price, by
THE IRON TRADE REVIEW CO.,
CHICAGO. CLEVELAND. PITTSBURG.

Second Edition Now Ready.

"METALLURGY OF CAST IRON"

By THOS. D. WEST; 107 engravings, 583 pages. Just issued. A valuable work to Founder, Molder, Draughtsman, Designer Technical School Specialist. Chemistry of Iron; cheaping of mixtures; the effect of the metalloids in changing the grade of iron; latest improvements in cupola construction and practice—all are fully covered. Price $3. Sent postpaid on receipt of price, by *The Iron Trade Review Co.*, Cleveland, O; 1522 Monadnock Block, Chicago, Ill.

James M. Swank, author of "Iron in All Ages," and editor of the *Bulletin* of The American Iron & Steel Association, in reviewing "Metallurgy of Cast Iron," says it is "One of the most valuable publications relating to the manufacture of iron castings, that has ever, to our knowledge been issued in this or any other country."

Persistence in Advertising

Is one of the requisites of satisfactory results. In the expansion of business which is confidently expected in the United States in the very near future, advertisers who have made themselves regularly prominent in the past two years will be first to reap the rewards of persistent publicity.

THE 1898 EDITION OF THE Iron and Steel Directory

Published by
The American Iron and Steel Association.
Will be sent postpaid by *The Iron Trade Review* at $7. Ready now.

Is a thorough revision of the list of blast furnaces, rolling mills, Bessemer and Open-Hearth steel works, plate and sheet mills, nail mills, tin plate mills, malleable, cast iron pipe and wrought pipe works, car wheel and locomotive works, with many new lists of works in other lines.

The Encyclopedia of Founding and Dictionary of Foundry Terms

Used in the practice of molding. Together with a description of the tools, mechanical appliances, materials, and methods employed to produce castings in all the useful metals and their alloys, including brass, bronze, steel, bell, iron and type founding, with many original mixtures of recognized value in the mechanic arts. Also aluminum, plating, gilding, silvering, dipping, lacquering, staining, bronzing, tinning, galvanizing, britannia ware, German silver, nickel, soldering, brazing, ores, smelting, refining, assaying, etc. By SIMPSON BOLLAND, author of "The Iron Founder," "The Iron Founder Supplement." 12mo.; cloth; sent postpaid on receipt of price, ... $3.00

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Crank Shapers 15-inch, 17-inch and 21-inch sizes, 26-inch and 28-inch Triple Geared Shapers.

OUR NEW 15-INCH BACK-GEARED CRANK SHAPER IS WORTHY OF YOUR SPECIAL ATTENTION. IT HAS NEW AND ORIGINAL FEATURES.

Information on request.

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Air Compressors,

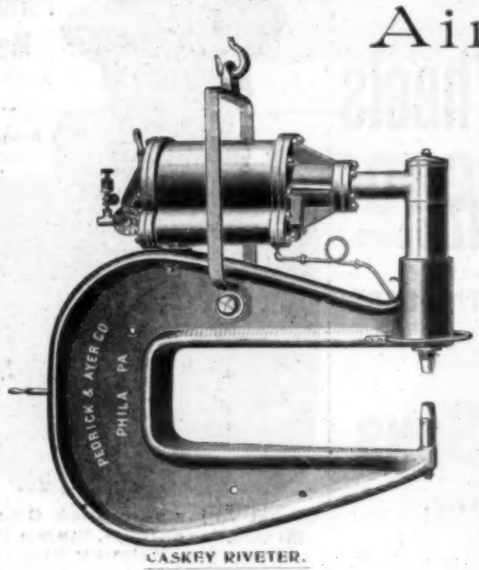
Compressed Air

RIVETERS,

Hoists, Cranes,

AND OTHER TOOLS.

FOR SHOP, YARD AND FOUNDRY USE.



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Our new line of ***Caskey Pneumatic Riveters*** *comprise several styles and sizes, and are adapted to any kind of work. These Riveters secure the maximum pressure on a rivet with as little weight in the machine as possible. They work rapidly, without jar or shock, and give a uniform pressure on every rivet.*

Special Styles Built to Order.

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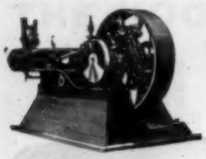

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VERTICAL SINGLE CYLINDER, 5 to 18 HORSE POWER.
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HORIZONTAL AUTOMATIC,
10 to 125 HORSE POWER.

Blowers,
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Electric Fans,
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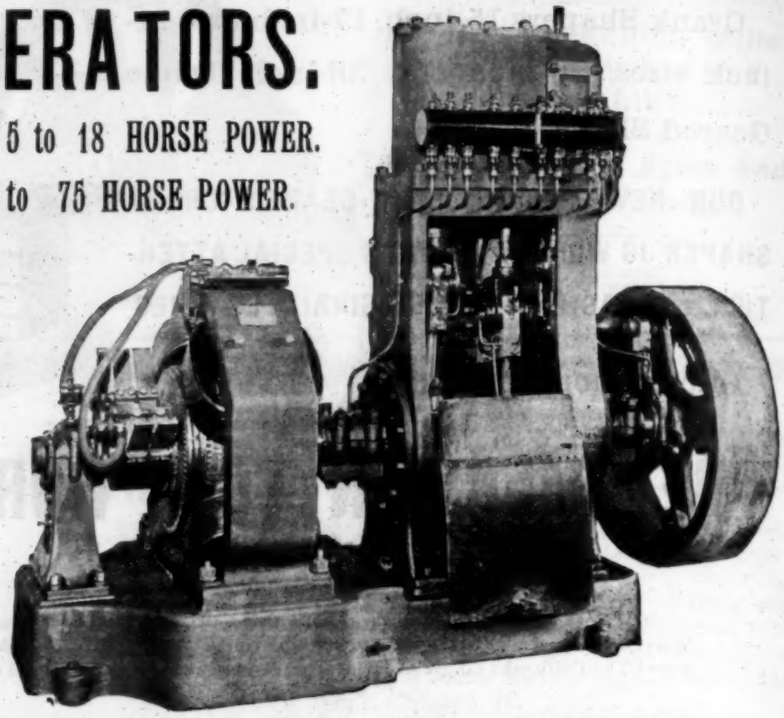
Blower System
of Heating and
Ventilation.



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135 North Third St. Philadelphia, Pa
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21 W. Nile St., Glasgow, Scotland.
4 Neue Promenade, Berlin, Germany.
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FOR GREAT TENSILE STRENGTH, ELASTICITY AND ELONGATION, COUPLED WITH UNUSUAL NON-CORROSIVE QUALITIES,

Castings and Propeller Wheels

MADE FROM

PARSONS MANGANESE BRONZE

CANNOT BE EXCELLED. WRITE FOR PARTICULARS.

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Ship and Engine Building Company,

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FRASER & CHALMERS,
556 Washtenaw Ave., Chicago, Ill.

Perforated Metals
A SPECIALTY

Samples on request.

Comet Adjustable Rock Crushers
Mining Machinery, Stamp Mills,
Smelters, Hoisting Engines.
SOLE MAKERS OF RIEDLER PUMPS.

Now is the time for you to spread out.

Extend your business and create a demand for your devices in new fields.

The man who whispers down a well,
About the things he has to sell,
Won't reap the golden dollars,
Like one who climbs a tree and—hollers.—Ex.

The Iron Trade Review is the best trade advertising medium in the Central West.

Has the largest paid circulation in its territory.

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FOR CAR WORK

and all malleable work there are no stronger or more satisfactory irons than

"Pioneer," "Antrim," "Elk Rapids"

LAKE SUPERIOR CHARCOAL IRON.

Superior Charcoal Iron Co.,

911, 912, 913 Michigan Trust Bldg.,
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As we control its manufacture
Our steel, we know will never fracture.
And We our reputation stake
On every rivet that we make.
VICTOR BOILER RIVETS
MANUFACTURED BY
CHAMPION RIVET CO. CLEVELAND
ARE THE BEST RIVETS MADE.

INDEPENDENCE WOOD SPLIT PULLEYS.

GRAIN ELEVATOR MACHINERY,
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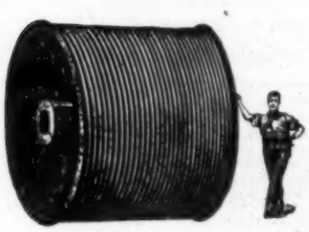

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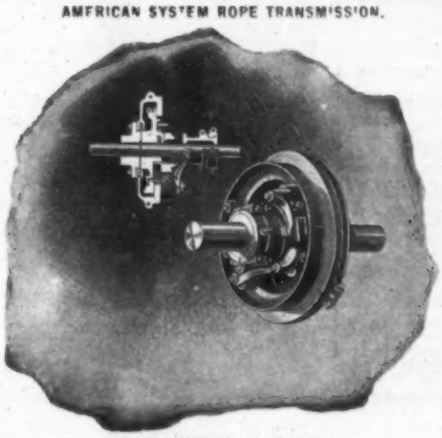
ENGINEERS, FOUNDERS and MACHINISTS.

AMERICAN SYSTEM ROPE TRANSMISSION.



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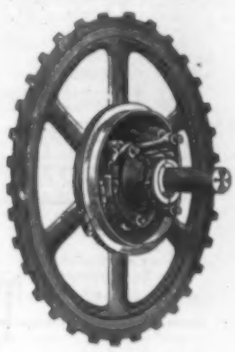

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BEVEL GEARS with perfectly correct teeth cannot be cast or turned up with ordinary machines.

We plane the teeth in gears we handle, and guarantee them theoretically correct. Our machinery enables us to turn out such bevels up to eight feet in diameter.

We would like to have your work and solicit correspondence.

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A complete illustrated exposition of the art of casting in iron, comprising the erection an dmanagement of cupolas, reverberatory furnaces, blowers, dams, ladles, etc., mixing cast iron, founding of chilled car wheels, malleable iron castings, foundry equipments and appliances, gear molding machines, molding machines, burning, chilling, softening, annealing, pouring and feeding, foundry materials, advanced molding, measurement of castings wrought iron, steel, etc. Also the founding of statues, the art of taking casts, pattern modeling, useful formulas and tables. By SIMPSON BOLLAND. Illustrated with over 200 engravings; 400 pages; 12mo; cloth $2.50

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CHICAGO. CLEVELAND. PITTSBURG.

Gears and Pinions

SPUR GEARS,
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BEVEL GEARS,
WORMS and RACKS.

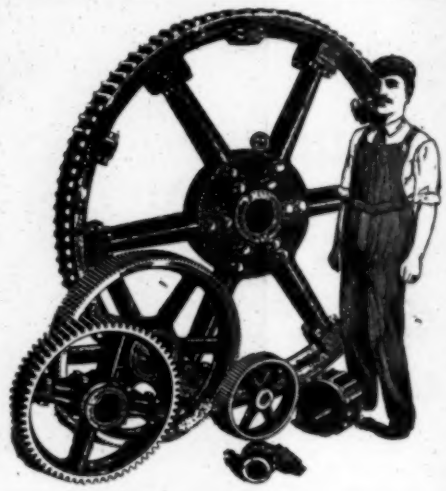
We make Gears of Steel, Mallea ble Iron, Cast Iron, Brass and Raw hide, and furnish them complete or cut as desired.

Gear Cutting of all Descriptions.

Material and workmanship the best.
Write us for estimates and prices.

THE VAN DORN & DUTTON CO.,

1796 East Madison Ave., Cleveland, Ohio.



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Cleveland Union Station.

Pennsylvania Lines.

Foot of Bank Street.

TICKET OFFICES at Station, Euclid Av., Woodland Av., and Weddell House corner.

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*Daily. †Daily except Sunday.

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Pittsburgh and Bellaire	† 7:00 am	†12:10 pm
Salem and Pittsburg	* 8:00 am	* 8:30 pm
Pittsburgh, Bellaire and East	† 3:15 pm	† 6:25 pm
Philadelphia and New York	* 2:10 pm	*11:30 am
Baltimore and Washington	* 2:10 pm	*11:30 am
Alliance and Pittsburgh	* 2:10 pm	*11:30 am
Ravenna and Alliance	* 5:00 pm	* 8:45 am
Philadelphia and New York	*11:10 pm	* 4:30 am
Baltimore and Washington	*11:10 pm	* 4:30 am
Alliance and Pittsburgh	*11:10 pm	* 4:30 am

Mt. Vernon and Pan-Handle Route

FROM CLEVELAND TO	LEAVE	ARRIVE
Columbus and Cincinnati	* 8:35 am	* 5:40 pm
Indianapolis and St. L.	* 8:35 am	* 5:40 pm
Millersburg and Akron	† 3:15 pm	†12:10 pm
Col., Cin., Ind. & St. L.	x7:40 pm	*7:30 am

The I. & E. Greenwald Co.

Engineers,
Founders and Machinists.

Steam Engines, Shafting, Hangers, Pulleys, Sprocket Wheels Chains Etc., Etc.

Headquarters for Mill Gearing of all kind and sizes.

Steam Power Plants complete.

720 East Pearl Street,
CINCINNATI, O.

Pittsburg Feed Water Heaters and Purifiers,

(Schlieper Patents).

Sweet's Steam Seperators, Ashton Pop Safety Valves, and Steam Gauges, Bonar Oil Filters, Bona Gauge Cocks, Steam Appliances of all Kinds.

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Pays special attention to iron ore, blast furnaces rolling mill, foundry and machine shop interests. Per year **$3.00.**

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Send sample or sketch for prices. Novelties and patented articles made by contract.

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MACHINERY FOR REDUCING AND POINTING WIRE

By Compression or Cold Swaging.

Especially adapted to Pointing Wire Rods and Wire for Drawing. For machines or information, address

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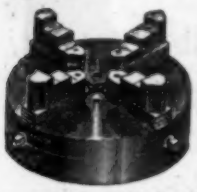

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Independent and Universal Chucks, Combination Lathe Chucks, with pt. reversible jaws, Drill Chucks, Planer Chucks and Face Plate Jaws. Send for Catalogue.

SKINNER CHUCK CO.
New Britain, Conn.

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THE W. P. DAVIS MACHINE CO.

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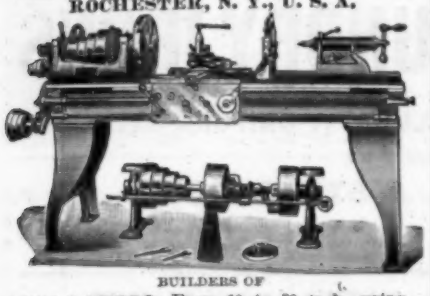

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FINE LATHES. From 10 to 30 inch swing. *Send for Catalogue.*

SAMUEL R. Mason ENGRAVING AND ELECTRO-TYPING

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We are particularly adept in mechanical wood engraving. Also make a specialty of fine half-tone photo engraving. Should be pleased to mail examples of our work on request.

HORSE AND MULE JEWELRY.

All tags and labels on genuine Covert Snaps, Webb Goods, Rope Goods and Chain Goods bear the above Trade Mark.

COVERT MFG. CO.

WEST TROY, N. Y.

The Cleveland Terminal & Valley R. R. Co

(B. & O. System.)

Depot foot of So. Water St. City Office 241 Superior St.	Arrive.	Depart.
Valley Jctn. & Way Stations..	*6:25 P M	*7:25 A M
Wheeling & Chicago.....	*9:25 P M	†7:25 A M
Akron, Canton & Chicago.....	*8:05 A M	*10:00 P M
Akron, Canton & Wheeling...	*10:30 A M	*3:30 P M
Akron, Canton & Chicago.....	*8:05 A M	*6:35 P M
Akron, Canton & Marietta,...	†2:10 P M	†11:00 A M
Pittsburg, Washington, D. C., & Baltimore.....	*10:30 A M	*3:25 P M

†Daily except Sunday. *Daily. Pullman's Palace Vestibule sleeping cars between Cleveland and Chicago, also Wasehington, Balto and Philadelphia.

ARMSTRONG MAN'F'G. CO.

WATER GAS AND STEAM FITTERS TOOLS

BRIDGEPORT, CONN.

New York Office, 139 Center Street.

The well merited reputation attained by our goods is our guarantee of their superiority. If you cannot get them of your dealer send to us for catalogue and prices.

TELL US

For what purpose you need Balls, and we'll tell you what kind to buy and how much they'll cost.

We are specialists in the making of LARGE BALLS for machine bearings, and we give our customers the benefit of our wide experience when our advice is asked.

CLEVELAND BALL & SCREW CO.,

Arcade, Cleveland, Ohio.

Excelsior Supply Co., 88-90 Lake St., Chicago, Ill., Chicago Agents.

IRON CLAD PAINT CO.

Factory, 75 & 77 Central Way. Sec. & Treas., No. 3 Case Build'g.

CLEVELAND, OHIO.

ORDER DIRECT FROM THE

Iron Clad Paint Co.

And get the genuine article, and save liability of suit for using an article made in violation of the patents issued to Wm. Green, and now owned by this Company.

IRON CLAD PAINT is the most durable, most fire-proof and Cheapest Paint made.

FURNISHED both Dry and Ground in Oil

USED BY NEARLY ALL THE RAILROADS.

DIXON'S SILICA GRAPHITE PAINT

FOR TIN OR SHINGLE ROOFS AND IRON WORK. IT IS ABSOLUTELY WITHOUT AN EQUAL.

Tin roofs well painted have not required repainting for 10 to 15 years.

If you need any paint it will pay you to send for circular.

JOSEPH DIXON CRUCIBLE CO., Jersey City, N. J.

BRASS FOUNDERS FINISHERS J. J. RYAN & CO.

88-74 West Monroe St., Chicago.

Best Bronze, Babbitt Metals, Brass and Aluminum CASTINGS On Short Notice.

COMPARE WEIGHTS

WHEN YOU ARE TOLD THAT JENKINS '96 IS MORE EXPENSIVE THAN OTHER PACKINGS.

Average weight, 1/8" "Jenkins '96," 11 lbs. to the square yard.
" " 1/8" Red Packing, 14 " " " " "

At 50c. per pound "JENKINS '96" is not only very much cheaper, but the best joint packing manufactured.

JENKINS BROS., New York, Boston, Philadelphia, Chicago

The Iron Trade Review

Pays special attention to iron ore, blast furnace, rolling mill, foundry and machine shop interests. Per year **$3.00.**

WHY NOT (PATENTED.)

Investigate the merits of the KING IMPROVED SAND BLAST for cleaning castings—both large and small. It will do the work to your entire satisfaction, and will do it quickly, thoroughly and cheaply. We can show you any quantity of the highest recommendations. Investigate it. Address

THE KING IMPROVED SAND BLAST CO., Station C, Detroit, Mich.

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General Office
BRIDGEPORT, O.
Manufacturers

PIG IRON
STEEL BILLETS
SHEET AND TIN BARS

SOFT STEEL

MERCHANT BARS AND SHAPES
SHEETS AND
LIGHT PLATES
GALVANIZED AND
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SALES OFFICES
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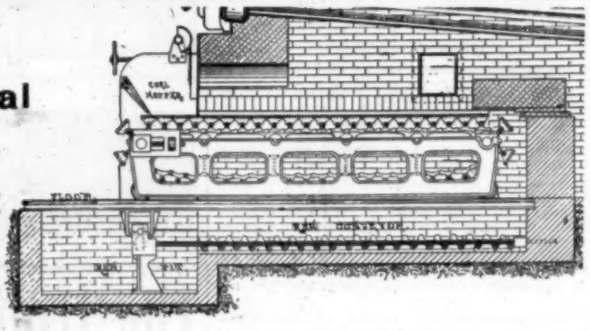

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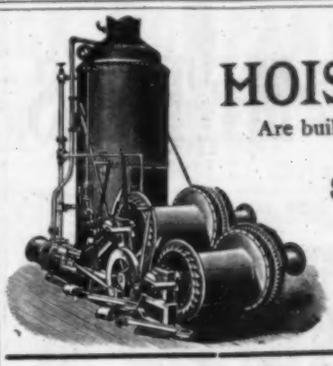

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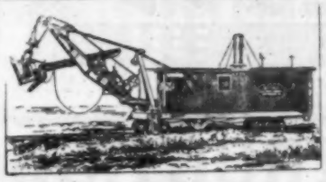

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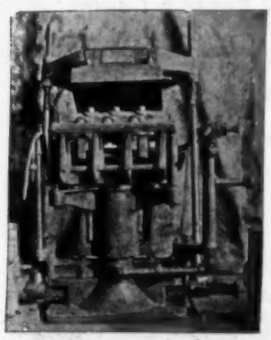

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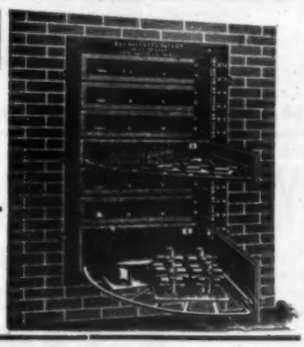

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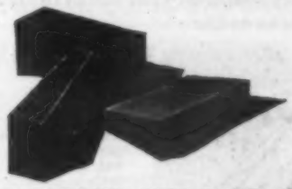

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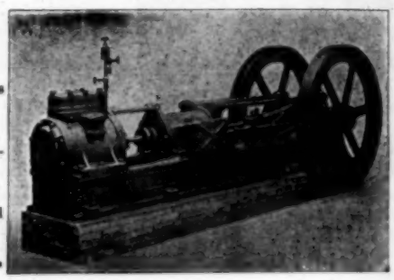

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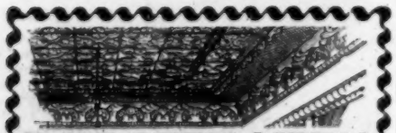

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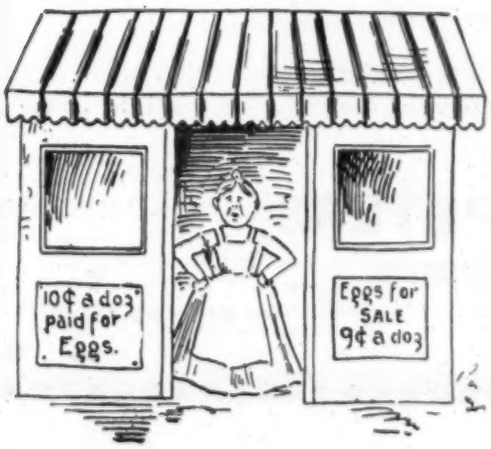

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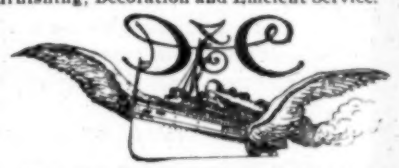

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DIRECTORY

To the Iron and Steel Works of the United States for 1898.

PUBLISHED BY
THE AMERICAN IRON AND STEEL ASSOCIATION.

Thoroughly Revised. Price, Seven Dollars.

The American Iron and Steel Association has just completed a thorough revision of its Directory to the Iron and Steel Works of the United States, bringing down to April, 1898, a description of these works. It also contains a complete Directory to many leading industries which are large consumers of iron and steel. This edition, which is the fourteenth that has been issued, embraces more complete details of all the iron and steel works of the United States, and of industries which are large consumers of iron and steel, than any preceding edition. It retains all the old features of preceding editions and contains many new features.

In the edition for 1896 there was given for the first time a complete list of Malleable Iron Works in the United States, and to this new feature there are now added complete lists of the Rail Mills, Structural Mills, Steel Casting Works, Bolt, Nut and Rivet Works, Chain Works, Seamless Tube Works, and Riveted Pipe Works—all new features.

The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description of their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition. It contains a complete list of all the

Blast Furnaces,
Rolling Mills,
Bessemer Steel Works,
Open-Hearth Steel Works,
Crucible Steel Works,
Plate and Sheet Mills,
Rail Mills,
Structural Mills,
Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
Bolt, Nut and Rivet Works,
Car Axle Works,
Car Wheel Works, and
Car Builders in the United States

ALSO A LIST OF THE

Iron and Steel Works in Canada and Mexico.

This edition of the Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

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Chemical and Metallurgical HANDBOOK

EXTRACT FROM PREFACE:

In the preparation of the second edition of our Handbook, the general plan of the first edition has been followed, viz., to present in concise form such data and information as are useful to the chemist and metallurgist. Several tables of the first edition, which were of somewhat limited use, have been omitted, while more than one hundred pages of new matter have been added.

The methods for analysis of iron ore, iron and steel and for assaying have been given briefly, but perhaps as much in detail as is consistent with the general scope of the book. Several changes and additions to the Specific Gravity tables have been made by adoption of later and more accurate values.

In the notes on blast furnace practice have been outlined the more important theoretical and practical points, which, it is hoped, will be of some service to those interested in the manufacture of iron.

The hygrometric table gives the necessary information for determining the amount of moisture in air, a subject whose importance in metallurgical operations is being more fully recognized at present than heretofore. This table is new and is based on the most accurate data available at the present time.

The tables of weights and measures, United States and foreign, have been very much amplified, and the conversion tables for United States and metric weight and measures of the U. S. Coast and Geodetic Survey included, the latter being based on the legal standard for this country.

Numerous miscellaneous tables have been added, which, it is hoped, will be found of value

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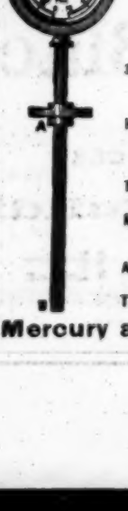

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A large factory having a surplus capacity for the next three or four months "between seasons" would be glad to help out overcrowded factories with boiler work, castings and machine work on a reasonable basis. Address

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Cold Pressed Nut and Washer Machinery.

12 to 14 Presses for making ⅜" to 1¼" nuts. 3 Washer machines. 3 Rattlers. 2 Reaming machines. 1 26" G & R Shaper. 1 No 3 Milling machine. 1 21" swing, 5' bed speed lathe with d. c. 1 16" swing, 9' bed engine Lathe, 1⅞ hollow spindle. 1 New Haven Planer 24x20x5'. 1 16" Drill, back gear, sliding head. 1 Railroad Spike machine, automatic. Entire outfit, whole or part

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[On Lake Erie Docks.]

Special low-phosphorus hard ore, Bessemer	$4 50
No. 1 Specular, Bessemer	$3.50@ 3.85
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Hematites No. 1 non-Bessemer	2.85@ 2.90
No. 1 Specular, non-Bessemer	2.50@ 2.75
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Cleveland (f. o. b. cars):

Bessemer	$21.75
No 1 Strong Foundry	$20 75@ 21.75
No 2 Strong Foundry	20.50@ 21 50
Gray Forge red short	18.75@ 19.25
No. 1 American Scotch	20 75@ 21.75
No 2 American Scotch	20.50@ 21.00
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[Delivered Cleveland.]	Gross Tons.
Old iron rails	$23 00
Old steel rails (6 ft. and over)	17.00
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	Net Tons.
No. 1 R. R. wrought scrap	$18.00
Mill scrap	13.50
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Iron axles	23.00
Axle turnings	13.00
Wrought turnings (free from cast)	10.00
Cast borings	9.00
Uncut wrought iron boilers	7 00
Steel boiler plates	12.00
Grate bars	9 00
Pipes and flues (clean)	12.50
Tank Iron	13.00
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Tees	2.40c
Universal plates	2.75c
Sheared plates	2.75@ 3.00c

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[Less than car-lots, Cleveland.]

Rounds and Squares—Bar Iron.	
1 to 1⅞	2.25 Base.
2 to 2¾	.20 extra.
3 to 3½	.50 "
3¾ to 4	1.00 "
4¼ to 4½	1.00 "
4¾ to 5	1.50 "
5¼ to 6	1.75 "
6¼ to 6½	2.00 "
6¾ to 7¾	2.50 "
⅜ to ⅞	.10 "
⅜ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
½ to 13 2	.50 "
5-16 to 1 32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.	
1¼ to 4 x ⅛ to 1	1.05 Base
4¼ o 6 x ⅛ to 1	.10 extra
6¼ o 8 x ⅛ to 1	.60 "
8¼ o 10 x ⅛ to 1	.80 "
1¼ o 4 x 1 1-16 to 1⅛	.30 "
4¼ to 6 x 1 1-16 to 1⅛	.40 "
6¼ to 8 x 1 1-16 to 1⅛	.60 "
8¼ to 10 x 1 1-16 to 1⅛	.90 "
2 to 4 x 1⅛ to 2	.30 "
4¼ to 6 x 1⅛ to 2	.40 "
6¼ to 8 x 1⅛ to 2	.80 "
8¼ to 10 x 1⅛ to 2	1.00 "
2to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅛ to 1⅜ x ⅛ to 1	.10 "
1 to 1 1-16 x ⅛ to ⅞	.20 "
⅛ to 15-16 x ⅛ to ⅛	.40 "
⅜ to 11-16 x ⅛ to ⅜	.50 "
½ to 9-16 x ⅛ to ⅝	.90 "

Heavy Band Iron.	
7 to 10 x ⅛ to 5-16	.70 extra.
6¼ to 6¾ x ⅛ to 5-16	.50 "
4¼ to 6 x ⅛ to 5-16	.30 "
1¼ to 4 x ⅛ to 5-16	.20 "
1 to 1⅜ x ⅛ to 5-16	.30
⅛ to 15-16 x ⅛ to 5-16	.50 "
⅜ to 11-16 x ⅛ to 5-16	.80 "
½ to 9-16 x ⅛ to 5-16	1.00 "
⅜ to 7-16 x ⅛ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ⅛ to 5-16 thick. Beval Edge Shaft Iron 1-10 higher than same size of Heavy Bands.

Light Band Iron.	
7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.30 "
1 to 1 3-16 x Nos. 10, 11 and 12	.40 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "

7-16 to ½ x No. 9 to 3-16.....1.30 extra
7-16 to ½ x Nos. 10, 11 and 12.....1.40
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Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.....
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⅜ to 1¼.....40 extra
⅜ to 13-16.....50 "
⅜ to 11-16.....60 "
⅜ to 9-16.....80 "
⅜ to 7-16.....1.10 "
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⅜ to 11-16 x ⅜.....1.20 "

Half Oval and Half Round.

2½ to 3.....60 extra
⅜ to 2.....50 "
⅜ to 13-16.....70 "
⅜ to 11-16.....90 "
⅜ to 9-16.....1.20 "
⅜ to 7-16.....2.50 "
7-16.....3.50 "
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Half Ovals less than ¼ their width in thickness extra price.

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All sizes.....1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

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Width In Inches.	English Standard Gauge.	
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base. Extras.
1¼ to 6,	" 10, 11, 12 or ¼"	.05 per 100 lbs
1 to 1¼,	" 7, 8, 9 or 3-16"	.10 "
1 to 1¼,	" 10, 11, 12 or ¼"	.15 "
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20 "
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25 "
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30 "
11-16 and ¾,	" 10, 11, 12 or ¼"	.35 "
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40 "
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45 "
½,	Nos. 7, 8, 9 or 3-16"	.55 "
½,	" 10, 11, 12 or ¼"	.60 "
7-16	" 7, 8, 9 or 3-16"	.75 "
7-16	" 10, 11, 12 or ¼"	.85 "
⅜,	" 7, 8, 9 or 3-16"	.95 "
⅜,	" 10, 11, 12 or ¼"	1.05 "

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.	
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base Extras.
7-16 to 2,	" 17, 18, and 19	.05 per 100 lbs
7-16 to 2,	" 20	.10 "
7-16 to 2,	" 21	.15 "
7-16 to 1¼,	" 22	.25 "
½ to 1¼,	" 13, 14 and 15	.05 "
½ to 1¼,	" 16, 17 and 18	.10 "
1¼ to 1¾,	" 19 and 20	per 10 lbs.
1¼ to 1¾,	" 21	.20 "
1¼ to 1¾,	" 22	.30 "
15-16 and 1,	" 13, 14 and 15	"
15-16 and 1,	" 16, 17 and 18	.15 "
15-16 and 1,	" 19 and 20	.20 "
15-16 and 1,	" 21	.25 "
15-16 and 1,	" 22	.35 "
¾,	Nos. 13, 14 and 15	.20 "
¾,	" 16, 17 and 18	.25 "
¾,	" 19 and 20	.30 "
¾,	" 21	.35 "
¾,	" 22	.45 "
¾ and 13-16	Nos. 13, 14 and 15	.30 "
¾ and 13-16	" 16, 17 and 18	.35 "
¾ and 13-16	" 19 and 20	.40 "
¾ and 13-16	" 21	.45 "
¾ and 13-16	" 22	.50 "
¾ and 13-16	" 23	.60 "
11-16,	Nos. 13, 14 and 15	.35 "
11-16,	" 16, 17 and 18	.40 "
11-16,	" 19 and 20	.50 "
11-16,	" 21	.60 "
11-16,	" 22	.70 "
11-16,	" 23	.80 "
⅝,	Nos. 13, 14 and 15	.40 "
⅝,	" 16, 17 and 18	.45 "
⅝,	" 19 and 20	.55 "
⅝,	" 21	.65 "
⅝,	" 22	.75 "
⅝,	" 23	.85 "
9-16,	" 13, 14 and 15	.45 "
9-16,	" 16, 17 and 18	.50 "
9-16,	" 19 and 20	.60 "
9-16,	" 21	.70 "
9-16,	" 22	.80 "
9-16,	" 23	.90 "
⅝,	" 13, 14 and 15	.55 "
⅝,	" 16, 17 and 18	.60 "
⅝,	" 19 and 20	.70 "
⅝,	" 21	.80 "
⅝,	" 22	.90 "
⅝,	" 23	1.00 "
7-16,	" 13, 14 and 15	.80 "
7-16,	" 16, 17 and 18	.90 "
7-16,	" 19 and 20	1.00 "
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½,	" 16, 17 and 18	1.10 "
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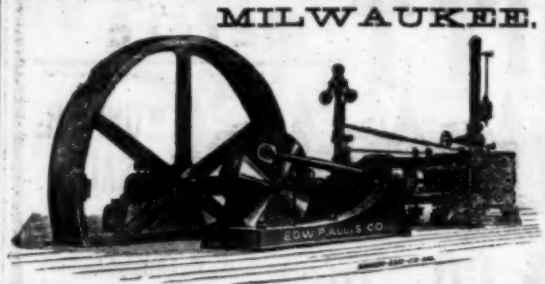

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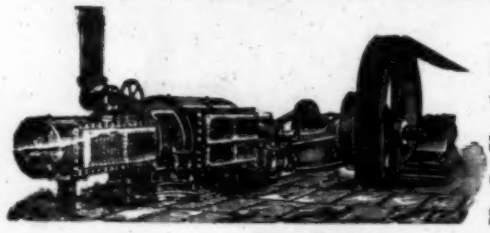

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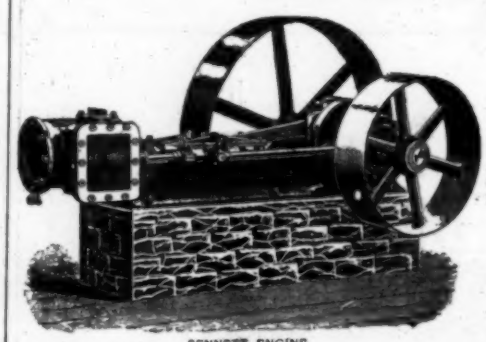
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METAL BEARINGS—
C. H. Besly & Co. Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelshia, Pa.
Swarts Metal Refining Co., Chicago, Ills
F. R. Phillips' Sons Co., Philadelphia, Pa.
J. J. Ryan & Co. Chicago. Ill.

MILLING MACHINES—
American Tool Works Co., Cincinnati, O.
W. P. Davis Machine Co., Rochester, N. Y.
U. Baird Machinery Co., Pittsburg, Pa.
Danielson Machine & Tool Co., Cleveland, O.
Manning, Maxwell & Moore, NewYrok City.

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C. H. Besly & Co., Chicago, Ill.
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Jeffrey Mfg. Co, Columbus, O.
Lidgerwood Mfg. Co, New York City.
Wm. Cramp & Sons, Philadelphia, Pa
The Bucyrus Co. South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Excelsior Iron Works Co., Cleveland, O.

MINE PUMPS—
E. M. Prescott Steam Pump Co., Milwaukee, Wis

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Tabor Mfg. Co., Elizabeth, N. J.

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Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.

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Baush & Harris Machine Tool Co., Springfield, Mass.

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Northampton Emery Wheel Co., Chicago, Ill.

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Upson Nut Co., Cleveland, O.

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OIL BURNERS—
W. S. Rockwell & Co., New York City.

OIL CUPS—
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James Bonar & Co., Pittsburg, Pa.

OIL FILTERS—
James Bonar & Co., Pittsburg, Pa.

OIL PUMPS—
C. H. Besly & Co., Chicago, Ill.

OIL SEPARATORS—
Harrison Safety Boiler Works, Philadelphia, Pa.
Austin Separator Co., Detroit, Mich.

ORE CARS—
The Pressed Steel Car Co., Pittsburg, Pa.

ORE CRUSHERS—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

ORE SCREENS—
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Robt Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.
Fraser & Chalmers, Chicago, Ill.

PACKING—
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Jenkins Bros., New York City.

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Jos. Dixon Crucible Co., Jersey City, N. J.
C. Wilford Peters, Cincinnat O.

PATTERN WORKS—
Gobeille Pattern Co., Cleveland O

PERFORATED METALS—
Seibel-Suessdorf Copper & Iron Mfg. Co., St. Louis, Mo.
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.

PIG IRON—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill
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M. A. Hanna & Co., Cleveland, O.
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American Tool Works Co., Cincinnati, O.

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Republic Iron & Steel Co., Chicago, Ill.

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PNEUMATIC TOOLS—
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R. Konigslow & Bro. Cleveland, O.
Danielson Machine & Tool Co., Cleveland, O.

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R. A. Delano, Chicago, Ill.
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The Aultman Co., Canton, O.
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I. & R. Greenwald Co., Cincinnati, O.

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Edw. P. Allis Co., Milwaukee, Wis.
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La Belle Steel Co., Pittsburg, Pa.
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Meehan Boiler & Construction Co., Lowellville, O
The Wm. B. Pollock Co., Youngstown, O.
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Monongahela Iron & Steel Co., Pittsburg, Pa.

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Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

TUBES—
National Tube Works, McKeesport, Pa.
Shelby Steel Tube Co., Cleveland, O.
S. Fix' Sons, Cleveland, O.

TUBE CLEANERS—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

TUBE WELDING—
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Cleveland City Forge & Iron Co., Cleveland, O.

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TWIST DRILL CASES—
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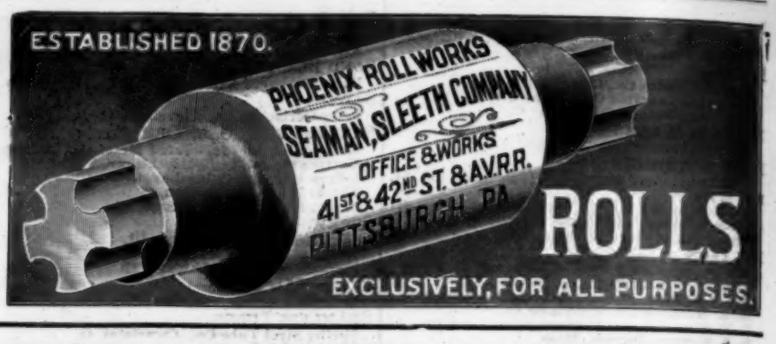

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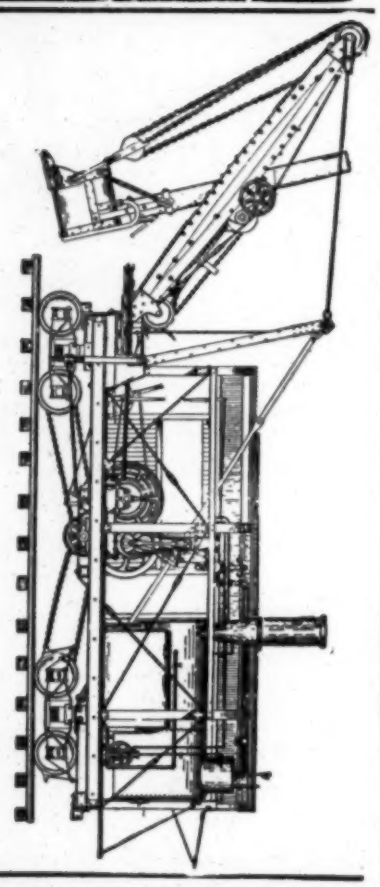

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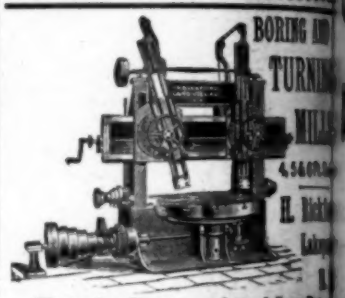

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